This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

V164
L79
no.1
1897

PUNICA GRANATUM.

2 45 0062 3471
LANE MEDICAL LIBRARY STANFORD

BY

JOHN URI LLOYD,

CINCINNATI, OHIO.

REPRINTED FROM
THE WESTERN DRUGGIST,
CHICAGO, MAY, 1897.

ARECA CATECHU, L.*

BY JOHN URI LLOYD.

BOTANICAL DESCRIPTION, CULTIVATION AND HISTORICAL NOTES.

The tree which produces the betel nut is a palm forty to sixty feet high and is extensively cultivated in the East Indies. Like many plants that have been cultivated for a long period, its native country is not positively known, though it is supposed to be at home in the Sunda islands. It has a straight, unbranched stem which is marked as are all palms with the scars of the fallen leaves. The large leaves are in a terminal cluster, each leaf being three or four feet long and consisting of numerous opposite pinnae. The flowers are very numerous, small, green and monecious; the male flowers more numerous, borne towards the ends of the branches of a large branched spadix. The female flowers are fewer in number and are borne near the base of the spadix. In the bud each of the young flower clusters is inclosed in two large boat-shaped spathes. The fruit are smooth, orange-colored drupes about two inches long, each containing a single globose reticulate seed bearing somewhat of a resemblance to a nutmeg. These seeds form the areca nuts of commerce.

The botanical synonyms for areca catechu, according to the Index Kewensis, which enumerates 28 species of this genus, are as follows:

A. cathecu, Burmannus; A. faufel, Gaertner; A. himalayana, Griffith; A. hortensis, Loureiro; A. nigra, Giseke.

The areca palm, or betelnut palm as it is improperly called, is cultivated over all of southern and central India, Ceylon, farther India and many islands of the Malayan archipelago. In Travancore alone, on the Malabar coast,

---

*The thanks of the writer are extended to Mr. C. G. Lloyd for botanical notes and to Mr. Sigmond Waldbott, librarian of the Lloyd Library, for invaluable assistance.

PUNICA GRANATUM.*

BOTANICAL HISTORY.

The genus punica consists at the present time of two species[1], the one under consideration and P. protopunica, described in 1882 by Balfour[2], from the island of Socotra.

Punica granatum has been in cultivation from the earliest historical times, and is now found in all warm countries of the world, and frequently as an ornamental plant in this country and abroad[3], where it requires protection during the winter season, as it will not endure the cold. It is recorded, e. g., that in 1838 the trees in the neighborhood of London were killed by the frost.[4] The form generally grown as ornament is the double variety, and consequently barren. The fruit of the pomegranate has been esteemed a delicacy from the most ancient time, and we often see it offered for sale at our fruit stands. In the West Indies, where the plant would thrive naturally, it is not extensively cultivated, and the writer of this botanical history (C. G. Lloyd), who has visited all these islands, does not remember to have seen it or its fruit there. Like all cultivated plants, it is liable to variation, and several of its forms have been considered distinct species and named by several authors; however, they are all now considered forms of one species.

The pomegranate plant is a shrub in cultivation in this country, but in the tropics reaches the height of a small tree 10 to 15 feet high. The leaves are opposite, are sometimes alternate above, oblong or lanceolate, thick and with entire margin. The flowers are bright-red and are clustered in the axis of the upper leaves. Varieties of white and even black (?) flowers are stated to exist in Java.[43] [44] The calyx is thick, leathery, adnate, with five to seven thick valvate sepals. The stamens are numer-

---

* The thanks of the writer are extended to Mr. C. G. Lloyd for botanical notes and to Dr. Sigmond Waldbott, librarian of the Lloyd Library, for invaluable assistance.

ous, inserted in the calyx tube. The petals are normally the same number as the segments of the calyx and inserted in the mouth of the calyx-tube alternate with its segments. In the double flowers commonly cultivated the petals are of course indefinitely increased by transformation of the stamens. The fruit, which has been prized for the pulp in which the seeds are imbedded, is about the size of an apple*, smooth, with a thick skin, and is in reality the enlarged calyx surmounted by its persistent lobes. It is divided by thin divisions into a number of cells, each packed full of angular seeds contained in a juicy pulp.

HISTORICAL NOTES.

The pomegranate shrub, according to De Candolle[6], is originally a native of Persia and adjacent countries, but has been cultivated and naturalized in the Mediterranean countries at such an early date that it has even been considered indigenous to these countries.

Pomegranate was included among the vegetables that were held sacred by the Assyrians[7] and the Egyptians;[8] and the latter nation made it a custom to place in the graves of the dead fruits of the field and garden, among them pomegranates, specimens of which are preserved to the present day[25]. The pomegranate had undoubtedly an occult significance with the ancient nations. It was frequently used as a mystical emblem in adorning the capitals of Assyrian[7] [9] and Egyptian[8] columns, and the Bible tells us that in the building of Solomon's temple the capitals of the columns were decorated with a "network of pomegranates."[10] Also the hem of the high-priest's robe was adorned with imitations of pomegranates in blue, purple and scarlet, alternating with bells of gold[11]. The pomegranate was one of the three fruits brought to Moses by the men that he sent to spy out the land of promise[12]. Many other passages scattered throughout the Bible refer to our plant[13], and testify to the esteem in which the tree and the fruit (then called rimmon) were held in ancient times. The fruit and seed of the pomegranate are mentioned in the "Arabian Nights."

---

* Called by Pliny malum punicum (Punic or Carthaginian apple).

Pomegranates were represented on Carthaginian and Phenician medals[14] and on the reverse of the coins of the island of Rhodes[8]. In Greek mythology the pomegranate is very conspicuous[15,16,17], and symbolizes fecundity and abundance. The fruit was dedicated to Juno, a deity always represented in sculptures as holding a pomegranate.[16]

The Greek authors, e. g., Theophrastus,[18] describe the pomegranate under the names of "roa" and "roa side"; also Dioscorides[22], who quite explicitly sets forth the medicinal properties of the different parts of the plant. Among Roman authors who describe the pomegranate and its uses are Cato Censorius[19], Pliny[20], Celsus[21], and others. Subsequent writers, for example the Arabians, in the ninth century, also refer to the pomegranate, but seem to have mainly reiterated the substance of the writings of their Greek and Roman predecessors.[14] Of the writers of the middle ages may be mentioned Tragus[23] and J. Bauhinus[24], the latter giving a most detailed compilation of that which was known before his time on the subject of the pomegranate, including the myths with which it is connected. It was not until the present century, however, that the literature of the pomegranate was enriched by the study of its chemical aspects.

CONSTITUENTS AND PROPERTIES.

The bark of the root, according to Wackenroder (1824), contains 22 per cent (according to a later authority, in 1880, 20 per cent) of a tannic acid, subsequently termed punicotannic acid. The astringency of the root is due to this principle and the aqueous infusion yields a dark-blue color or precipitate with ferric salts. In 1878 and 1880 Tanret discovered several alkaloids in the root-bark, the most prominent of which he called pelletierine. This has been shown to possess the anthelmintic properties of the root.[25] The amount of alkaloids in the root-bark seems to vary according to the variety of flowers, the white-flowering variety, occurring in Java, yielding as high as 3.75 per cent of hydrochlorids of total alkaloids.[43] The bark also contains mannite and a yellow coloring matter. A yellow stain is produced if the inner surface of the root-bark is moistened with water and rubbed on paper[26].

The rind of the fruit also contains a considerable amount of tannic acid, about 19 per cent. It is stated that the rind of the fruit of the wild pomegranate is more astringent than that of the cultivated.[27]

Pomegranate flowers called balaustion by Dioscorides,[22] also are rich in tannic acid, have a bitterish and astringent taste, but no odor. They color the saliva violet-red.

USES.

For Tanning.—Pliny[20] mentions that the rind of the sour variety of pomegranate was used as a tanning material.*

Shortly after the days of Pliny the Moors introduced tanning into Spain, and their finest moroccos were tanned with the rind of this fruit.[13] Tanning in this manner is still in vogue in some countries, e. g., Tunis, where the pomegranate abounds;[25] also in Japan.[28].

For Dyeing.—The rind of the pomegranate, especially that of the wild plant, has been used in India as a dye-stuff from ancient times. Alexander Burnes, in his travels, describes "a little yellow flower," called Esbaruk, which grows in the low hills near Karshi and Balkh (in Afghanistan), and says that it is used as a dye-stuff. He incidentally remarks that it produces a better color than the root of the pomegranates.[29] Balaustion flowers are stated by Pliny[20] to be used for dyeing cloth.

As an Article of Food.—The refreshing and cooling taste of the pulp of this fruit gave the plant great favor with the ancient natives of oriental countries, and also in our age the pomegranate is sometimes used as a table fruit.[25] The opinion of its excellence, however, is not by any means shared universally.[14] Pickering[30] states that in his experience the best pomegranates are found in Mascat in Arabia. From this province the fruit is frequently imported into India.[31] Wine frequently was made from the pomegranate in Palestine, as evidenced from the biblical name "gath rimmon," meaning press of the pomegranate;[32] and in Persia, where whole woods of pomegranates are to be found.[29] The art of making wine from this source was raised to the importance of a national industry.[4]

---

* Hence the name "malicorium," from corium, Latin for leather. Another official name of the rind has been cortex psidii (25).

As a Tenifuge.—Charaka-Samhita[33], probably the oldest medical work in the world, in its translation does not mention the bark of either the tree or the root of pomegranate and does not mention it in connection with tenicides.* The anthelmintic properties of the root and rind, however, were well known to the ancient people of more proximate historical age. Newberry[34] quotes from a description on the "Papyrus Ebers," discovered in recent times, on which is found the following passage: "To drive away the worm: Make an infusion of the rind of pomegranate." The Chinese also were acquainted with the anthelmintic property of the root.[25] Among the Roman authors, some, as e. g. Cato Censorius[19] and Pliny,[20] recommend the fruit rind; others, e. g. Celsus[21], the bark of the root as an efficient vermifuge. The Arabian writers maintain that the root-bark is a perfect specific for tapeworm.[35]

Constantinus Africanus, a prominent physician of the Salernian school of medicine, is quoted by Tragus as follows: "Boil the peelings of pomegranate in wine, and drink this potion; it will kill all the worms, especially the kind called 'ascarides,' and it is the peculiar property and nature of the pomegranate to kill worms."[22] This virtue of the plant, curiously enough, afterwards seems to have been entirely overlooked by the medical profession, and slumbered until the beginning of this century.

In 1807, Dr. Buchanan, an English physician in India, announced to Europe the fact that in India, from time immemorial, the root of the pomegranate tree was used against tapeworm with miraculous success.[36]. He cited successful cases from his own practice and that of others: "I have seen two species of tenia expelled by this medicine; one is solium, the other not yet described.†" The correctness of these statements was subsequently borne out by the testimony of various eminent physicians. Dr. Gomez of Lisbon successfully treated fourteen persons for tapeworm in 1822, and the results were afterwards published in France by Merat.[14] The latter publication seems to have contributed largely to spread the use of this drug as a remedy for tapeworm throughout Europe. In England, however, pomegranate, it seems, has not as yet replaced the male-fern.[26] In India the drug is now considered the sovereign remedy for tenia, as various writers testify.[39 40 41]

---

* However, the work of translation is not complete as yet.

† For a list of references in this direction see Mêrat & De Lens (14).

In this connection it may be of interest to state that in India the pomegranate root-bark is seldom met with in the shops. As few gardens are without the plant, it is freshly dug when required.[35] Royle[27] and others[42] maintained that the dry bark seems not to contain any definite tenicide principles, but De Vrij brought evidence to the contrary.[44] However, the alkaloid pelletierine was tried as a tenifuge with much success[35] and is now extensively employed in the form of a tannate.

The balaustion flowers possess no tenifuge property. Merat and De Lens state[14] that according to Cullen the rind of the fruit has less vermifuge power than the bark of the root, which statement is supported by the evidence of physicians for whom the writer has prepared the remedy.

Other Uses in Medicine.—The pomegranate, besides being used as a vermifuge, is employed, although more rarely, for other medicinal purposes, e. g., for arresting hemorrhage and healing ulcers.[20] Charaka-Samhita[33] gives the fruit (rind?) a position as an astringent (p. 15 and 33) in diarrhea. Two varieties are described (p. 357), both being known under the name "dadima." In modern India, a decoction of pomegranate rind is used in combination with aromatics and opium, for diarrhea, and a decoction of the root is said to be useful in the advanced stage of dysentery[40]. The ancient writers, as Dioscorides[22] and Pliny[30], indicate numerous uses in medicine for the various parts and the several species of the pomegranate, some passages furnishing rather curious reading matter, which, however, we cannot find space to repeat.

PHARMACOPEIAL RECORD.

The antiquity of the plant explains the fact that the drug found a place in early pharmacopeias. The Pharmacopœia Borussica of 1829 (5th edition) recognized *granatum*, cortex pomi and flores balaustiae. In the 6th *edition of 1846*, however, we find only cortex radicis granati. This was extended in the 1882 edition to cortex granati, which meant the bark of the plant and that of the root. The balaustion flowers, usually collected from the double variety, were still official in 1844 in the Dublin Pharmacopeia.

As regards the United States Pharmacopeia, granatum was first recognized in 1830, the Philadelphia edition introducing the rind of the fruit, the New York edition the bark of the root. The subsequent editions carried both, until in 1880 the rind of the fruit was dropped. In the 1890 edition the stem-bark was added.

LITERATURE OF PUNICA GRANATUM.

(1). Index Kewensis, fasc. IV, p. 662, 1895.

(2). Balfour, Proc. Roy. Soc., Edinburg, XL, p. 512, 1882.

(3). Miller Philip, The Abridgment of the Gardeners' Dictionary, 5th ed., London, 1763.

(4). John Smith, Dictionary of Popular Names of Plants, p. 232, London, 1882.

(5). Linnaeus, Spec. Plant., 2d ed., Vol. II, p. 676, Holmiae, 1764.

(6). De Candolle, Origin of Cultivated Plants, p. 237, New York, 1885.

(7). E. Bonavia, Flora of the Assyrian Monuments, Westminster, 1894.

(8). J. G Wilkinson, A Popular Account of the Ancient Egyptians, 2 vols., New York, 1854.

(9). A. H. Layard, Nineveh and Its Remains, Vol. II, p. 233, New York, 1853.

(10). 1st Book of Kings VII, 18, 20.,

(11). Exodus XXVIII, 33, 34.

(12). Th. M. Harris, The Natural History of the Bible, p. 346, Boston, 1820.

(13) Henry S. Osborne,, Rev., Plants of the Holy Land, pp. 131-134, Philadelphia, 1861.

(14). Mérat & De Lens, Dictionn. Universelle de Mat. Méd., Vol. V, pp. 538-542, Paris, 1833.

(15). Victor Hehn, Kulturpflanzen und Hausthiere in ihrem Uebergang aus Asien nach Griechenland und Italien, 3d ed., pp. 206-211, Berlin 1877.

(16). J. H. Dierbach, Flora Mythologica, pp 107-110, Frankfurt-am, 1833.

(17). Richard Folkard, Plant Lore, Legends & Lyrics, pp. 499-502, London, 1892.

(18). Theophrastus Eresius, (370 (or 392) to 288 (or 286) B. C.) De Historia Plantarum Libri Decem. Joannes Bodaeus a Stapel et Julius Caesar Scaliger, Amstelodami, 1644, pp. 390-394.

(19). Cato Censorius, 234-149 B. C. De Re Rustica, p. 127.

(20). Pliny (23-79 A. D.) Lib. XIII, Cap. 19 and lib. XXIII, cap. 6. With French translation and notes by Poinsinet de Sivey.

(21). Celsus (25 B. C.—50 A. D.), De Medicina. Also see English translation, 2d ed. by G. F. Collier, London, 1831.

(22). Dioscorides (middle of 1st century) Lib. I, cap. 151-154. With Latin translation by C. G. Kühn, Lipsiae, 1829.

(23). Hieronymus Bock (Tragus), Kreuter buch, p. 390, Strasburg 1556.

(24). Joh. Bauhinus, Historia Plantarum, Vol. I, pp. 76-84, Ebroduni, 1650.

(25). Flückiger, Pharmacognosie des Pflanzenreichs, 3d ed., p. 513, Berlin, 1891. Also see Flückiger & Hanbury, Pharmacographia, 1879.

(26). Bentley & Trimen, Medicinal Plants, Vol. II, No. 113, London, 1884.

(27). Royle, Materia Medica, 6th ed., by Harley, p. 615, London, 1876.

(28). E. Mafat, Jahresber. d. Pharm., 1892, p. 13. From Pharm. Journ. & Transact., 1892. p. 145.

(29). Alexander Burnes, Travels into Bokhara, Vol. II, pp. 126 and 167, London, 1834.

(30). Charles Pickering, Chronological History of Plants, p. 41, Boston, 1879.

(31). John Graham, A Catalogue of Plants Growing in the Vicinity of Bombay, p. 72, Bombay, 1839.

(32). Baudissin, Studien zur semitischen Religions Geschichte, pp. 305-308, Leipzig, 1876.

(33). Charaka-Samhita, date undetermined, trans. from the Sanskrit and published by Avinash Chandra Kaviratna, Calcutta, 1892 to date.

(34). Percy E. Newberry, Notes on the History of Medicine in Ancient Egypt, Pharm. Journ. & Trans., 1888-89, Vol. XIX, p. 408.

(35). Dymock, Warden & Hooper, Pharmacographia Indica, Vol. II, pp. 44-49, 1890-1893.

(36). Francis Buchanan, Account of an Indian Remedy for the Tape Worm, Edinburg Med. & Surg. Journ., pp. 22-24, 1807.

(37). B. A. Gomez, Memoria Sobre a Virtude Taenifuga de Romaira, Lisboa, 1822.

(38) J. C. Weissius, Diss. de Malo Punico, Altdorfii, 1712.

(39). W. Ainslee, Materia Indica, Vol. I, p. 322, Vol. II, p. 175 London, 1826.

(40). Waring, Pharmacopoeia of India, p. 93, 1868.

(41). Roxburgh, Flora Indica, p. 402, Calcutta, 1874.

(42). E. Aweng, Jahresb. d. Pharm., 1890 p. 114.

(43) W. Stoeder, Jahresb. d. Pharm., p. 114, 1890.

(44). J. E. De Vrij, Pharm. Jour., Vol. XXI, p. 758. See also Jahresb. d. Pharm., 1891, p. 130.

Note.—Owing to the extent of the literature involved in the study of this subject many valuable publications and a mass of interesting reading matter have necessarily been excluded.

164
-792
no.2
1897

2 45 0062 3489
LANE MEDICAL LIBRARY STANFORD

ARECA CATECHU, L.

BY

JOHN URI LLOYD,

CINCINNATI, O.

REPRINTED FROM
The Western Druggist,
CHICAGO, MAY, 1897.

v 164
L792
no. 3
1897

Cephaelis Ipecacuanha.

LANE MEDICAL LIBRARY STANFORD
2 45 0062 3497

BY
JOHN URI LLOYD.
CINCINNATI, O.

REPRINTED FROM
THE WESTERN DRUGGIST,
CHICAGO, AUGUST, 1897.

CEPHAELIS IPECACUANHA.*

BY JOHN URI LLOYD.

BOTANICAL DESCRIPTION AND SYNONYMS.

The plant which produces this drug belongs to the large natural order of rubiaceae, which includes a number of our medicinal plants. The stem of the plant is simple, short, shrubby, seldom over two feet high, bearing opposite leaves above, and usually naked below. The roots are numerous, branched, and covered with a thick, ringed bark, which is very characteristic of the drug. The leaves are opposite, petioled, entire, smooth, dark-green, and usually crowded near the top of the plant. At the base of each pair of leaf stalks there is a pair of whitish, laciniate, cut stipules, similar to the stipules which we find in several of the rubiaceae of this country. The flowers are small, white, funnel-shape, and collected with a terminal head (whence the generic name of the plant†), which is enclosed in four large ovate bracts. The stamens and pistils are dimorphous, that is, some flowers bear long stamens and short pistils, and conversely, other flowers short stamens and long pistils.

The name cephaelis ipecacuanha, designating the genuine ipecacuanha plant, has by no means the merit of priority. Different authors have successively assigned it to different genera[44], as follows: *Uragoga*, (Linnaeus, 1731); *psychotria*, (Linnaeus, 1759); *cephaelis*, (Swartz, 1788); and *callicocca*, (Schreber, 1789.) The following synonyms now exist:

(1) *Uragoga ipecacuanha*, established by Baillon[81] quite recently (1879), evidently by right of priority which is claimed for the generic name uragoga.

---

*The thanks of the writer are extended to Mr. C. G. Lloyd for botanical notes, and to Dr. Sigmond Waldbott, librarian of the Lloyd Library, for invaluable assistance.

(2) *Psychotria ipecacuanha.* This is the name now recognized by the Index Kewensis[44], in which Stokes, Bot. Mat. Medica (1812), is credited as introducing the name of the species. Recently (in 1881) the name has been authoritatively proposed again by Müller Argoviensis[29].

(3) *Callicocca ipecacuanha*, Brotero, 1802[7].

(4) *Cephaelis ipecacuanha*, Willdenow, 1804[9].

(5) *Cephaelis ipecacuanha*, De Candolle, 1804[9a].

(6) *Cephaelis emetica*, Persoon, 1807[10].

(7) *Cephaelis ipecacuanha*, Tussac, 1813[11].

(8) *Cephaelis ipecacuanha*, A. Richard, 1820[14].

The conferring of the latter names involves certain historical points of interest which we will now consider.

HISTORICAL NOTES.

The beginning of the history of ipecacuanha root and the first study of its virtues is clouded in mystery and fable. It is stated that the South American Indians were acquainted with the medicinal properties of the plant, having gained their experience from observing the habits of animals[15].‡ A vague yet probably the first source of information on the subject of ipecacuanha root is found in a work published in London in 1625, named "The Pilgrimes," by Samuel Purchas, which in five volumes gives an account of many travels and the natural history of foreign countries[1].

In Vol. IV, page 1311, where Brazilian plants and their uses are considered, the following passage occurs:

"*Igpecaya* or *pigaya* is profitable for the bloudie fluxe. The stalke is a quarter long and the roots of another or more, it hath only four or five leaves, it smelleth much wheresoever it is, but the smell is strong and terrible." The subsequent description of its medicinal virtues bears further evidence that we have here a plant at least closely related to official ipecacuanha. According to a printed note at the head of that chapter, the author is believed to

---

†From *Kephale* (Greek), a head.

‡This fable has a parallel in the quaint description given by Clusius concerning the discovery of the healing virtues of nux vomica bark in cases of snake bite.

be a Jesuit by the name of Manoel Tristaon, who probably wrote the treatise in the year 1601.

The first definite information we have of ipecacuanha dates from the publication of a work by Piso and Marcgraf, called "Historia Naturalis Brasiliae," Amsterdam, 1648, chapter LXIV being entitled "De Ipecacuanha ejusque Facultatibus."[2] Two species are described, a white and a brown species, the latter evidently being the true ipecacuanha plant. An illustration of the plant is added, which Mérat considers quite a creditable reproduction of the true ipecacuanha. The entire chapter was reprinted, with French translation, by Mérat, and inserted in his "Dictionnaire," as a testimony of the extreme exactness of the description given by Piso[17].

The root first came to Europe in 1672 through the agency of Le Gras, who sought to introduce it into medical practice. Keeping a stock supply in the care of an apothecary by the name of Claquenelle in Paris, he associated himself with J. A. Helvetius, a physician of German descent, who had graduated under the medical faculty at Reims. However, the venture was at first a failure, owing to the employment of too large doses.

In 1680 a merchant by the name of Garnier in Paris, well acquainted with the medicinal virtues of the root, sent for a supply, obtaining 150 pounds from Spain. Through this gentleman, directly or indirectly, Helvetius secured a new lot of the drug, which he skilfully managed to exploit by extensively advertising it as "radix antidysenterica," the origin of which, however, he kept a secret. Finally the fame of the remedy came to the notice of Minister Colbert, who ordered that the remedy be given an official trial in the Paris municipal hospital.

In 1688 Helvetius obtained the sole license for the sale of the drug which proved to be an efficient, or at least popular, remedy among the members of an aristocratic patronage, including no less a personage than the dauphin. King Louis the XIV then bought the secret from Helvetius for 1,000 louis d'or, and made the remedy public property. He was induced to do so by the combined influences of his physician, Ant. d'Aquin, and of Franç.

de Lachaise, confessor to the king. Garnier, the merchant, however, brought suit in order to obtain his share of profit in the transaction, but was unsuccessful in his efforts.

After the use of the drug had thus been established in France, the remedy was introduced into other countries, e.g. by Leibnitz (1696), and Valentini (1698), into Germany, and 1694 by Fried. Dekker into Holland.

During the first part of the eighteenth century the drug was in frequent use in the various pharmacies of Germany, as is evidenced from its being mentioned in several old documents of that age. It is, for example, mentioned in the authoritative drug list of the Silesian town of Strehlen in 1724. For earlier references see note 39.

However, during the increasing employment of the drug, in the latter part of the eighteenth century, much confusion arose as to its botanical origin, inasmuch as it became the habit to designate as ipecacuanha any emetic plant, regardless of its botanical source. A long list of such plants is enumerated, for example, in Martius[16]. In this manner the characteristics of the plant furnishing true ipecacuanha root became almost forgotten, other plants being substituted for it. Ray, for example, held it to be a species of *paris*, and no less an authority than Linnaeus himself thought *viola ipecacuanha* now known as *ionidum ipecacuanha*, (see allied species to be the plant yielding true ipecacuanha root[6].

In 1764, Mutis, a celebrated botanist in Santa Fe de Bogota, sent the younger Linnaeus a Peruvian emetic plant with description, which he thought was the true ipecacuanha root. Linnaeus fil. accepted the statement of Mutis as correct and, moreover, believing the illustration given by Piso of the true ipecacuanha plant to represent the specimen he received from Mutis, in 1871 gave it the name *psychotria emetica*, Mutis[17].

To Dr. Gomez, who in 1800 returned from Brazil, is finally due the credit of having corrected this error. He reestablished the nearly forgotten botanical character of true ipecacuanha in his memoir published at Lisbon in

1801[6], wherein he describes and figures the plant, and especially distinguishes it from psychotria emetica, Mutis.

Having donated some specimens of the plant in his possession to his fellow countryman, F. A. Brotero, professor of botany, Coimbra, the latter published an account of it (1802) in the Trans. Linn. Soc., naming it *callicocca ipecacuanha*[7], but without giving credit to the source of his information, which chagrined Gomez considerably[17]. Twelve years later Brotero left a copy of his article with a botanist by the name of Hectot, of Nantes, who communicated it to M. Tussac, and the latter, in publishing it,[11] gave it the name *cephaelis ipecacuanha*, also laying stress upon its distinction from *psychotria emetica*, Mutis, perhaps without having had any knowledge of Gomez's paper written twelve years before.

In 1820 A. Richard again called attention to this distinction[14], but, as it seems, also without giving proper credit to Gomez, with the result that later authorities frequently quote the true ipecacuanha root under the name of cephaelis ipecacuanha, A. Richard.

CULTIVATION AND COLLECTION.

The peculiar structure of the flower requires the intervention of insects for the purpose of fertilization; when cultivated in hot-houses it is therefore necessary to transfer mechanically some pollen to the stigma, if the plant is expected to bear fruit[32].

In 1849 Weddell[15] called attention to the fact that a fragment of the plant will strike root if allowed to lie on the ground for any length of time. The corners of the leaf stalks are especially prone to issue such adventitious roots, and the stem will also bud when in contact with the ground. This property of the ipecac plant was rediscovered in 1870 by McNab[24]. Probably this reproductive power accounts for the plant resisting extermination, notwithstanding the rapacious method employed in collecting it.

The root is dug all the year round, but especially in the months of January and February, when it is in bloom. It is perhaps to be regretted that the collection is not postponed until May, when the fruit ripens, for then the scattered seeds would insure a new growth. It is stated that, owing to the vicious system of collection, the plant has become scarce in the vicinity of large cities, as Rio de Janeiro. Professor Rusby states that the scarcity in trade of the root during a recent period is also due to the fact that the attention of the natives has shifted towards the rubber industry[36].

The most abundant growth of the drug, on the authority of Weddell[19], is to be found in the interior of the Brazilian province of Matto Grosso. The "poayeros," as the collectors of the plant are called, skillfully cut off the root, taking care to leave part of it in the ground, afterwards they carefully fill the hole again with earth. By taking this precaution, it is stated that after three or four years a new crop may be gathered at the same spot. A skilled poayero collects thirty pounds a day, but the average is not more than six to ten pounds a day[26].

Since 1866 attempts have been made by the British to transfer the cultivation of ipecacuanha to India, but these efforts seem not to have been successful. From one specimen sent to India by Hooker in 1866, an increase of but eleven plants resulted to the date of 1872. Upon McNab's discovery of the propagation by root, 300 specimens obtained in this manner were sent to India and planted in dark woods of the hot and moist valleys of British Sikkim in the Himalaya mountains. Although they multiplied in one season to an aggregate of 6,000 specimens, the cultivation seems from some cause to have been impractical. Arthur Meyer concludes from a study of the anatomy of the leaf that the plant, while preferring dark locations, requires at least a certain amount of light, and suggests that cultivation may succeed better in moist woodlands in the direct shade of single trees[22].

CHEMICAL CONSTITUENTS.

While the root of the ipecacuanha plant is the only official part, its active emetic principle has recently been shown to exist also in other parts of the plant, e. g., the stems and the leaves[40], but not in the seeds[39].

In 1817 *Pelletier and Magendie*[12] isolated from true ipecac root an alkaloid which they called *emetine*, but the fact that they obtained 16 per cent of this principle demonstrates their product to have been merely a concentrated extract. Upon further experimentation, however, Pelletier succeeded in obtaining a pure alkaloidal product in the amount of sixty grains to the pound, which corresponds to somewhat less than 1 per cent[17].

Subsequently, the chemistry of ipecacuanha root was elaborated by Reich[21], Lefort[22] and others. H. Kunz[28] in 1887 established for emetine the formula $C_{20} H_{30} N_2 O_6$, which is now generally adopted as correct.

Kunz also discovered the presence of cholin in ipecac root and established the dyad nature of the alkaloid emetine in its saturation power with acids, which in 1890 was confirmed by Blunt[37] and W. Simonson[38]; hence the statement in Flückiger[39], that emetine is a monad basis, requires correction. In 1894[43] and 1895[46] Paul and Cownley discovered another alkaloid in ipecac root which they called *cephaeline*. This they distinguished from emetine principally by its solubility in caustic alkalies, and by its melting point, this being 102 deg. C, while for emetine they found 68 deg. C.

Pelletier[12] also discovered that emetine was naturally combined with what he took to be gallic acid, but which was recognized later by Willigk[20] as a new substance and by him called ipecacuanhic acid. Reich[21] subsequently found it to be a glucosid.

Starch is present in large amounts, and a trace of a nauseating ethereal oil is also present. In some allied species sugar abounds[39].

Literature concerning the assay of ipecacuanha has been abundant and often discordant during the last ten years, but we seem now to have approached a satisfactory solution of the problem, which, however, we cannot consider in detail herein. The proportions of total alkaloids observed by different authors generally ranged from 1 to 3 per cent. Keller thinks that 2½ per cent may not be too excessive a standard of alkaloidal strength[41].

Dohme[45] has found that the part of the root where it merges into the stem is at least as rich in alkaloid as the rest of the root. The woody core of the root was at one time supposed to be inert, and was therefore rejected in the German pharmacopeias of 1867 and 1872.

ALLIED SPECIES AND ADULTERATIONS.

The species allied to true ipecacuanha, as they sometimes occur in commerce, have various trade names and may be referred on the whole to the following (three) species:

1. *Psychotria emetica*, Mutis. (See history.) This root is much thicker than the genuine, is not annulated, but indentated at long intervals, and marked by longitudinal striæ. The fracture is dark-violet, and the root contains much sugar, on account of which it has been termed ipecacuanha glycyphloea by Vogl[23]. According to Flückiger[39] and Tschirch[35], no emetine is to be found in this root.

2. *Richardsonia scabra*, L., undulated or white, farinaceous ipecacuanha; is not annulated.

3. *Ionidium ipecacuanha*, St. Hilaire, also called poaya blanca, white ipecacuanha, belongs to the natural order of violaceæ. It is distinguished by containing inulin and salicylic acid, but no emetine[39]. For excellent illustrations of false as well as the genuine species, see among the older works, Esenbeck[16], also Goebel and Kunze[18].

Tschirch and Lüdtke[35] have laid down explicit characteristics of true ipecacuanha root and allied species, based on microscopic and chemical examination. Similar examinations have been conducted very recently in order to establish data to exclude Carthagena ipecac (*cephaelis acuminata* Karsten) and other species from the powdered drug[47].

Ipecac root, when whole, presents such distinctive features that it is almost impossible that an adulterant should not at once be recognized; only in powdered form is the door open to falsification. Stephen and Churchill record an instance where for "powdered ipecacuanha root" alant (elecampane) root was mixed with tartar emetic[16]. More recently Mercer reports the adulteration of powdered ipecacuanha root with almond meal[17]. However, no difficulty whatever need be experienced in obtaining pure powdered ipecac in the United States. Pharmacists willing to pay its value can procure this drug of unquestionable purity.

PHYSIOLOGICAL NOTES AND PHARMACOPEIAL MENTION.

Ipecacuanha root, from its first appearance in our materia medica, has been prized as an antidysentericum and emeticum. In small doses it acts as a tonic and is believed to promote the peristaltic motion of the intestines[6]; in larger doses it is antiperistaltic, causing nausea and vomiting.

In recent years a preparation of ipecacuanha has appeared on the market, which is free from emetine, and is commended in cases of acute dysentery, whereby the symptoms of nausea produced by emetine are claimed to be obviated[42]. We have no authoritative evidence, however, to support the claims that have been made for this de-emetinized ipecac.

The peculiar effect that the dust of ipecacuanha powder exerts upon the respiratory organs of some persons has been noted by early observers. Lewis, in 1761[4], makes the following statement: "Geoffroy observed that in pulverizing considerable quantities, the finer powder that flies off, unless great care be taken to avoid it, is apt to afflict the operator with difficulty of breathing, spitting of blood, and bleeding at the nose, or swelling and inflammation of the eyes and face, and sometimes of the throat, adding that these symptoms disappear in a few days, either spontaneously or by the assistance of venæsection." Kunze[18] (1830) reports a case of poisoning in this manner which was treated by blood-letting and the taking of a decoction of uva ursi and extract of rhatany; in another more recent instance, relief was afforded by a dose of extract of quebracho[34].

Ipecacuanha has been recognized by nearly all pharmacopeias and dispensatories since about 1750. The botanical names affixed to the plant reflect the changes in the nomenclature of the drug as recorded in the preceding historical notes. In American pharmacy the drug was also in earliest use. From 1840 to 1870 its botanical name has been cephaelis ipecacuanha, De Candolle. The Pharmacopœia Portugueza of 1876 gives credit to Dr. Gomez for his part in reestablishing the botanical source of the drug.

LIST OF REFERENCES TO CEPHAELIS IPECACUANHA.

(1.) Manoel Tristaon, in "His Pilgrimes" by Samuel Purchas, Vol. IV, p. 1311, London, 1625.

(2.) Piso and Marcgraf, Histor. naturalis Brasiliae, Cap. LXIV, Amsterdam, 1648.

(3.) Pomet, hist. générale des drogues, Vol. I, p. 47, 1694. Also see Biographie universelle, Vol. XX, p. 23, Paris, 1817, and Eloy, Dict. Hist. d. l. Méd., Vol. II, p. 482. Mons 1787.

(4.) Lewis, Materia Medica, p. 316, London, 1761.

(5.) Daniel Wickman, Viola Ipecacuanha Upsal, 1774, in Linn. Amoen. Acad., Vol. VIII, pp. 238-248.

(6.) Antonio Bernardino Gomez, Memoria sobre Ipecacuanha fusca do Brazil, Lisbon, 1801.

(7.) Felix Avellar Brotero, Trans. Linn. Soc., Vol. VI, p. 137, London, 1802.

(8.) Cullen, Materia Medica, Vol. II, p. 267, New York, 1802.

(9.) Willdenow, C. L., Berlin, Jahrbuch, f. die Pharmacie, 1804, p. 73.

(9a.) DeCandolle, Rech. bot. méd. sur div. esp. d'ipécac. Bull. soc. éc. d. méd., Vol. I, p. 92, 1804.

(10.) Persoon, synopsis plantarum, 1807, Vol. I, p. 203.

(11.) Tussac, Notice sur les genres et espèces de differ. Végétaux Ipécac. Jour. de Bot., Vol. IV, p. 244, 1813.

(12.) Pelletier and Magendie, Jour. d. Pharm., Vol. III, p. 145-164, 1817.

(13.) Buchner, Rep. d. Pharmacie, Vol. VII, p. 239-357, 1819.

(14.) A. Richard, Histoire Naturelle et méd. de diff. esp. d. Ipecacuanha du commerce. Paris, 1820.

(15.) Th. W. C. Martius, Die Brechwurzeln Brasiliens, Buchner's Rep., Vol. 22, p. 1-46, 1825.

(16.) Nees von Esenbeck, Plantae Medicinales, Vol. II, Nos. 256, 258 and 259, Düsseldorf, 1828.

(17.) Mérat et de Lens, Dictionnaire de Matière Médicale, Vol. III, pp. 638-649. Paris, 1831.

(18.) Goebel and Kunze, Pharm. Waarenkunde, Vol. II, (1830-34) pp. 214-228.

(19.) Weddell, Ann. d. Sciences Nat., Vol. XI, pp. 193-202, 1849.

(20.) Willigk, Jahresb. d. Pharm., 1850, p. 28.

(21.) Reich, Die Ipecacuanha, Prize Essay, Jena, 1863.

(22.) Lefort, J., Jour. Pharm. Chim. (4) Vol. IX, p. 167.

(23.) Vogl, Commentar, z. oest. Pharm., Vol. I, p. 333, 1869.

(24.) McNab, James, Notes on the propagation of the Ipecacuanha plant, Edinb. 1870. Also see Trans. Bot. Soc., Edinb., Vol. X, p. 318.

(25.) Planchon, Jour. de Pharm., Vol. XVI, p. 406, 1872.

(26.) Balfour, Proc. Roy. Soc. Edinb., Vol. XXVI, p. 781, 1872. Also see Pharm. Jour. (3) Vol. I, p. 630, 1871, and Vol II, pp. 949 and 969, 1872.

(27.) John Mercer, Adulteration of powd. Ipecacuanha, Pharm. Jour. (3), Vol. IV, p. 569, 1874.

(28.) H. Kunz, Jahresb. d. Pharm., 1879, p. 272.

(29) Martius, Flora Brasiliensis, fasc. 84, p. 341, 1881.

(30.) Bentley & Trimen, Medicinal Plants, Vol. II, No. 145 and Vol. III, No. 177, London, 1880.

(31.) Baillon, Nat. History of Plants, Vol. VII, p. 280, London, 1881.

(32) Arthur Meyer, Psychotria Ipecacuanha, Archiv. d. Pharm., Vol. 221, p. 721-745, 1883.

(33.) A. B. Lyons, Pharm. Jour., Vol. XVI, p. 627, 1886.

(34) American Journal of Pharmacy, 1886, p. 117.

(35.) Tschirsch & Lüdtke. Ueber Ipecacuanha. Archiv. d. Pharm. Vol. 226, p. 441-456, 1888.

(36.) H. H. Rusby, Pharm. Jour., Vol. XIX, p. 1056, 1889.

(37.) Thos. P. Blunt, Pharm. Jour. (3), Vol. XX, p. 809, 1890

(38.) Wm. Simonson, Proc. Am. Ph. Assoc., 1890, p. 188.

(39.) Flückiger, Pharmacognosie des Pflanzenreichs, 3rd ed., p. 421-428, Berlin, 1891.

(40.) Hooper, Proc. A. Ph. A., No. 40, p. 750, 1892. See also Pharm Jour., Vol. XXII, p. 591, 1892.

(41.) C. C. Keller, Proc. A. Ph. A., No. 41, p. 400, 1893. See also Jahresb. Pharm., 1893. p. 176.

(42.) Kanthack & Caddy, Pharm. Jour., June, 1893, p. 990.

(43.) Paul & Cownley, Jahresb. Pharm., 1894, p. 523.

(44.) Index Kewensis, 1894.

(45.) Dohme, A. R. L., Proc. Am. Ph. A., No. 43, p. 269, 1895.

(46.) Paul & Cownley, Jahresb. Pharm., 1895, p. 163.

(47.) Albert Schneider, A Study of Ipecac, Amer. Drugg., July, 1897.

L792
no. 4
1897

LANE MEDICAL LIBRARY STANFORD
2 45 0062 3609

VANILLA PLANIFOLIA.

BY

JOHN URI LLOYD,
CINCINNATI, O.

REPRINTED FROM
The Western Druggist,
CHICAGO, DECEMBER, 1897.

V164
L792
no. 4
1897

LANE MEDICAL LIBRARY STANFORD
2 45 0062 3609

VANILLA PLANIFOLIA.

BY

JOHN URI LLOYD,
CINCINNATI, O.

REPRINTED FROM
The Western Druggist,
CHICAGO, DECEMBER, 1897.

VANILLA PLANIFOLIA.

BY JOHN URI LLOYD.*

BOTANICAL DESCRIPTION.

The plant that produces vanilla is an orchid, native of the tropical forests of Mexico, but now grown in many warm countries, as in Brazil, Honduras, Java and the West Indies. In the West Indies the writer of this botanical description has seen it in most of the botanical gardens in Jamaica, Dominica and Trinidad, although in but one island is it grown to any extent as an article of commerce—viz., in the French island of Guadaloupe.

As has been shown by Darwin, most orchids depend on insect agency for fertilization, and vanilla is no exception. In Mexico, where it is native, it is naturally fertilized by insects which occur there, but when raised in any other country it must be fertilized by artificial means.

The plant which produces the bean is a vine with a thick succulent stem and entire, thick, smooth, pointed leaves. It is furnished with numerous aerial roots, with which it clings to its support. Two statements have been made regarding it. One, that it is a parasite, deriving its nourishment from the tree to which it clings; the other, that it is an epiphyte[22] (as many orchids are), living entirely on moisture and nourishment derived from the air. Neither opinion is exact. After the vanilla plant has established itself it will continue to grow even if its connection with the ground is severed and will throw out new roots which reach and penetrate the ground. Hence it is to some extent epiphytic. But should it fail to establish its connection with the ground, it will finally wither and die.[23] It is in no sense a parasite. In the West Indies it is grown in bamboo joints, with a very little earth, which are hung up in branches of trees.

---

* The thanks of the writer are extended to Mr. C. G. Lloyd for botanical notes, and to Dr. Sigmond Waldbott, librarian of the Lloyd library, for invaluable assistance.

The flowers are produced in axillary bunches of eight or ten. They are of a pale-yellow color, about two inches in diameter, have the usual orchidaceous structure, but are more regular in appearance than most orchids.

The fruit is a pendant pod five to ten inches long and an inch or more in circumference when fresh, and contains myriads of minute seeds. These pods when properly cured and dried are the vanilla* of commerce.

As an evidence of the vitality of the vanilla plant, the following, from Miller's Gardener's Dictionary,[2] may be quoted:

"I had some branches of this plant which were gathered by Mr. Robert Millar at Campeachy, and sent over between papers by way of sample, and had been at least six months gathered when I received them; but upon opening the paper I found the leaves rotten with the moisture contained in them, and the paper was also perished with it, but the stems appeared fresh; upon which I planted some of them in small pots and plunged them into a hotbed of tanner's bark, where they soon put out leaves and sent forth roots from their joints."

EARLY HISTORY.

The conquering Spaniards found vanilla in use as a flavor for cacao among the Aztecs of Mexico, and naturally made this plant known to Europe.[3] It was then described and illustrated by Hernandez, the "Pliny of the Spaniards," in his history of Mexico, describing it under both the botanical name, "aracus aromaticus," and its vernacular name "tlilxochitl."[18] Clusius mentions it in 1602 as "lobus oblongus aromaticus." Pomet, in 1694, reports the use of vanilla in France to flavor chocolate and sometimes to perfume snuff.[10] As early as 1721 vanilla was introduced into the London pharmacopeia,[15] and in 1739 Mr. Ph. Miller planted some vanilla specimens (*vanilla aromatica*, Swartz) in the Chelsey botanical garden.[4] In the West Indies and the adjoining coast of South America vanilla has also long been known.

In 1724 P. Labat, a Catholic missionary, reports (from hear-say) the abundant occurrence of vanilla in the "terre

---

**Vaina*, Spanish for pod, hence *a small pod.*

ferme" of Cayenne, from which place specimens were forwarded to him in 1697 to Marinique, where the cultivated the plant and observed its habits for eight years. He also planted vanilla in Guadaloupe.[1] In 1750 P. Gumilla met vanilla in the Orinoco country.[18] To Humboldt[3] we owe the first authentic and detailed report on Mexican vanilla. The Mexican province of Oaxaca supplied the first vanilla export to Spain, and the bean was discovered in this province by De Menonville in 1777.[10] Vanilla forests, according to old archives, have been in cultivation at Papantla, near Vera Cruz, as early as 1760.[23]

The species yielding the finest-flavored vanilla, subsequently named *vanilla planifolia*, Andrews, was imported from America into England by the Rt. Hon. Charles Greville,[4] this flowering in his collection at Paddington in 1807.[14] Specimens of this plant were later transferred to Paris and Belgium, from whence the botanical gardens of Reunion (Bourbon) and Java were supplied. In 1830 Neumann introduced the artificial fecundation of vanilla planifolia in the Jardin des Plantes at Paris, and in 1837 Prof. Morren did the same at Liege.[18] The Java plantation, started in 1841, now supplies the Dutch market solely.[21]

The Reunion plantation, according to Delteuil,[9] was started by Perrottet in 1839.[18] The cultivation of vanilla for the purpose of export was subsequently introduced into other French colonies—e. g., into Mauritius by M. Richard, into Guadaloupe (in 1875), Martinique, Ste. Marie (near Madagascar), and into Tahiti of the Society Islands. In Jamaica individual attempts to cultivate vanilla are on record (see botanical description).[19] The cultivation in Calcutta, however, according to reports by Dr. King, seems to be a failure.[13] Suggestions have been made of a more energetic prosecution of the vanilla culture in Jamaica,[12] in Venezuela and Guianá[10]; also of an introduction of this article into the extreme southern parts of the United States, Florida and Texas.[6]

CULTIVATION OF VANILLA.

Vanilla may be propagated from seeds, or, as the vine produces adventitious roots, by cuttings. The latter method is almost exclusively employed. Propagation by cuttings is conducted now according to methods established more than a hundred years ago (see article by Ph. Miller[2] in the Gardener's Dictionary, 1763). A warm and moist climate, sandy, moist (not marshy) soil, a mixture of shade and sunshine, the shade predominating, is essential to its successful cultivation. The temperature should average from 75 to 80 deg. F.,[24] but should not fall below 65 deg. F. in winter.[23] An extremely high temperature is likewise disastrous. Dr. King of the Calcutta Botanical Gardens (1876) reported that an extremely high temperature caused pod-laden plants to drop their fruit prematurely.[13]

Vanilla plantations in Mexico differ from those in the French dominion (Reunion), in that in Mexico the vanilla growers permit the vine to climb trees to any height and in any direction, while in the French plantations the vine is guided along trellises in such a way as to permit of easy access. Another distinction between the two has been cited in that the Mexicans rely on natural methods for fertilization of the flowers, while in Reunion the flowers are fertilized artificially.

When a virgin forest is to be transformed into a vanilla plantation, all superfluous shade must be removed. Consequently, shrubs, climbing plants and large trees are cleared away. Lactiferous young trees are allowed to remain to support the vine, the accepted impression of the natives being that vanilla draws its sustenance from the sap of the tree to which it clings, an opinion that, as has been stated, is not supported by scientific investigation. The woodland being properly cleared, two cuttings of the vanilla vine are planted in a shallow trench close to each tree. Three joints are buried in the earth, the remainder of the vine three or four feet in length, being tied to the tree. Unless the vines are set out in the rainy season they must be watered frequently. In about four weeks the cuttings will have rooted, and in the third year they begin to bear fruit, and continue to bear for from thirty to forty years.

If a plantation is to be established in an open field, the shade trees must first be cultivated. Sawer[20] describes the method employed in Reunion as follows:

"All trees are good as protectors except those that *change their bark.* The best are mango tree, blackwood (acacia Lebbeck), dragon-tree (dracaena draco or pterocarpus draco), jacktree (artocarpus integrifolia, L.), the *ouatier* (bombax malabaricum) and the pignon d'Inde (physic-nut, jatropha curcas), but this last should not be planted alone, because it sheds its leaves when the vanilla plants are bearing; the sun then striking upon the vine and the pods, would be injurious to both. The protecting trees should occasionally be pruned, so as to produce a *half-shade* or checquered shade, and should have attained a sufficient growth to produce this *demi-jour* before the vanillas are planted."

The tendrils should be tied with several flat strips, not round twine, as the latter seem to strangle the plant. The bast or fiber from the leaf of pandanus vacoa is used for this purpose. The plantation should not be too near the seashore, unless protected by forests to ward off the salt air, which sickens the plants. Flowers appear in March and continue until May.

Fecundation of the Flowers in Reunion.—Observation and some reflection have shown that the yield of vanilla may be improved considerably by artificial fecundation of the flower, and this process is largely in vogue in Reunion (Bourbon), while in Mexico and Guiana fertilization is left to natural influences—e. g., the wind and the action of insects. In Mexico, as a consequence, twelve to twenty-six inches of vine will produce about forty flowers and only one pod, while all the flowers could have been artificially fertilized.[20] The obstacle to spontaneous fecundation being the interposition of the labellum (the upper lip of the stigmatic orifice) between the stigma and the anther, artificial fecundation formerly was effected in Reunion by cutting away this obstacle. But later, following the observation of a Creole slave, it was found as easy simply to slip the labellum from under the anther, whereby the latter organ comes into direct contact with the stigma, thus effecting fertilization. Fecundation must be carried out judiciously to prevent the degeneration of the fruit; it is for example, possible to obtain as many as 3,500 pods on a single plant, but such a demand upon the plant's vitality would cause it to perish before the pods could ripen. For an interesting account of this subject, epitomized from Delteuil's work,[9] see J. Ch. Sawer.[20]

Gathering the Vanilla.—The vine blossoms from March to June; the pod matures in about two and one-half months, but does not ripen until January or February. Some persons consider that a greenish-yellow color of the pod establishes its ripeness, while others contend that the only sure criterion is the crackling sound produced when the ripe pod is pinched between the fingers. Unfortunately most vanilla is picked before it ripens, as early as October or November, the reasons being:

1. Demand for the new crop.

2. To prevent opening of the pod and loss of the dark red juice (balsam of vanilla), which exudes when the pods ripen and split open.

3. To save the crop from thieves. Humboldt, in 1811, called attention to this problem,[3] and recently Hires, in his exceedingly interesting "Talk on Vanillas,"[23] stated that the entire crop may be stolen when the first fruit is ready to harvest, and that rather than submit to such loss the beans are gathered unripe and sold at a low figure. "For no other reason is the fruit gathered and sold before it is thoroughly ripe."[23]

Vanillas gathered before they ripen remain red and are subject to subsequent deterioration. They command a lower price than the ripe fruit and weigh a pound less per 1,000 beans.[23] Upon the other hand, over-ripe fruit turns brown, and if allowed to remain on the vine turns black, opens and exudes the afore-named balsam of vanilla. Finally the pod becomes brittle and is of little value.

When the crop is to be gathered, the Indians remain in the forests about eight days successively, then bring the amount collected and sell the fresh pods to the settlers, who cure, dry, bundle and press them for market. (Humboldt, 1811.)[3]

Curing Vanilla.—The value of vanilla depends greatly on the success of the curing process, for, during the manipulation the flavor of the bean is developed by a peculiar, artificial fermentation. J. Ch. Sawer[20] makes the following statements with regard to the processes employed in Mexico, and also in Reunion, Peru and Guiana:

Curing in Mexico.—"The pods are placed in heaps under a shed, protected from sun and rain, and in a few days, when they begin to shrivel, are submitted to the sweating process. If the weather happens to be warm and fine, the pods are spread out in the early morning on a woolen blanket and exposed to the direct rays of the sun, the dark coffee-color which they acquire being deeper in proportion to the success of the sweating operation. In cloudy weather the vanilla is made into bundles; a number of these are packed together into a small bale, which is first wrapped in a woolen cloth, then in a coating of banana leaves, and the whole, inclosed in a mat, is firmly bound and sprinkled with water. The bales containing the largest beans are now placed in an oven heated to 140 deg. F. When the temperature of the oven has fallen to 113 deg. F., the smaller beans are introduced and the oven is closed tightly. Twenty-four hours afterward the smaller beans are taken out and twelve hours later the larger ones. During the sweating the vanilla acquires a fine chestnut color. It is now spread on matting, exposed to the sun every day for about two months, and when the drying is nearly complete, is spread out in a dry place, and finally tied up in small packs."[16]

Hires[23] states that close inspection and fine eyesight is necessary in the expert, for every diseased bean must be excluded. One unsound specimen endangers not only the bundle containing it, but other bundles as well, which become affected in a short time. It is not unusual for the best experts to carry the drying process to extremes, at the expense of costly loss in weight, in order to prevent the subsequent attacks of insects. Ripe vanilla is cured much more easily than the immature beans and the flavor is more permanent, prime ripe pods becoming silver-white with crystals in a few months, whereas, if the fruit is gathered green, crystals are absent and the vanilla is difficult to preserve.

In the paper referred to, Hires does not mention the *oiling* of the beans, but previously, in 1892, he had stated that after curing, each bean is rubbed with the oil that oozes during the sweating process and which is carefully collected for this purpose.[23] Miller[2] remarks that during the curing process, when the beans are about half dry, they are braided and afterward rubbed with oil. He states that oil of palma christi or cocoa is employed, after which the beans are exposed to the sun, when they are again oiled. Other writers state that oil of cashew nut is also used.[17] When cured the beans are assorted and tied into bundles containing from fifty to seventy-five each. In the Misantla district, in Mexico, the beans are finally assorted into four or five grades:

First, *la vanilla fina*, subdivided into *la grande fina*, twenty-two Cm long, and *la chica fina*, 17 Cm long. The latter is half the value of the former.

Second, *el zacate*, a thin, long, moist pod, which must be aired, particularly after a long sea voyage.

Third, *el rezacate*, smaller than the preceding.

Fourth, *la basura*, the offal or refuse. This serves as the upper and under layer in the chests, the finer qualities being packed in the center. These refuse beans are very short, and packed in bundles of one hundred each in order to distinguish them.[8]

Finally, the bundles are packed in cans containing forty bundles each, and four or five of these cans are packed in a case of Mexican red cedar, which is the most suitable and plentiful wood in the vanilla land. These hand-made cases cost from $2 to $3, but there are no saw mills to cheapen the lumber. Finally they are covered with fiber matting (see illustration), and transported to the seashore by caravans of mules or burros, each beast having two cases strapped to its back, and during the journey it is watched by two or three attendants. So opposed are the natives to the introduction of a railroad as to have led them to hang a civil engineer who desired to survey the country.[23]

Curing in Reunion.—The pods are sorted according to length, scalded in water of 194 deg. F., the long ones for ten seconds, the medium and short ones from fifteen seconds to one minute. They are then exposed for from six to nine days to the sun, between woolen blankets, until they acquire the characteristic chestnut color; then spread out under sheds roofed with zinc and allowed to dry gradually for about a month, being frequently turned in the meantime. When they have acquired the proper degree of dryness and can easily be twisted around the finger without cracking, they are ready to undergo the smoothing process, each bean being repeatedly passed between the operator's fingers. Oil now exudes from the entire surface of the bean and imparts lustre and suppleness to it. When sufficiently dry they are tied in bundles of uniform length.[20]

By a process recently introduced in Reunion drying is effected by means of calcium chloride in specially constructed air-tight boxes of galvanized iron, the usual charge being 40 pounds of calcium chloride and 100 pounds of vanilla pods.[30]

In Peru, the pods are dipped into boiling water, tied at the end and hung in the open air for twenty days; then they are lightly smeared over with oil of palma christi and a few days later are tied in bundles.

In Guiana they place the beans in ashes until they begin to shrivel; they are then wiped clean, rubbed over with olive oil, and their lower end having been tied, they are left to dry in the open air.[20]

COMMERCIAL VARIETIES.

Mr. Beringer,[21] in 1892, described the following species of vanilla found on the American market:

Mexican, Bourbon, Seychelles, Mauritius, Tahiti, South American vanilla, and vanillons.

The Mexican vanilla, on account of its superior aromatic flavor, commands the highest market price. Mr. Beringer describes it as follows: "Prime Mexican vanilla is from eight to ten inches long, flattened, and about three-eighths of an inch in diameter at the broadest part. Its upper end or end of attachment tapers gradually for about one-quarter of the length of the pod, and is usually curved and slightly twisted toward the point. The lower end is but very slightly attenuated. The color is a dark brown, and the odor is pleasant, aromatic and characteristic. The surface is ridged longitudinally, the ridges being interspersed with finer striations and warty excrescences. The pods feel firmly plump, and while fresh the surface is somewhat viscid, but nevertheless there is a roughness to the touch which becomes more pronounced as it gets older and dryer. Acicular crystals commence to form at the ends and gradually extend over the surface. The interior is filled with numerous black seeds and a small quantity of pulp."

The crystals covering the beans are called "frost"

(French, "le givre"), and were formerly believed to consist of *benzoic acid*, until in 1859 Gobley established its distinction from this substance and gave it the name *vanillin*, believing to have found in this substance the aromatic principle of vanilla. However, the subsequent artificial production of vanillin has not been able to displace materially the use of the beans. Neither does the amount of the vanillin present in vanilla beans indicate their quality. Suffice it to say that the best Mexican vanilla has been found to contain only 1.69 per cent vanillin, while Bourbon contained 2.48 and Java 2.75 per cent vanillin. Sometimes benzoic acid is dusted over an inferior bean to give it the appearance of a high-grade article. This may be recognized, according to Schimmel & Co. (1888) by abstracting the benzoic acid crystals with sodium carbonate, adding sulfuric acid and metallic magnesium or zinc; the odor of oil of bitter almond will then be developed.

Bourbon vanilla, from the island of Reunion, is dark-brown, nearly black, in color, of a not unpleasant odor, which is, however, different from Mexican vanilla, more resembling Tonka bean. The difference is stated to be more pronounced if a piece be steeped in hot water.[21] Unlike Mexican vanilla, the touch is smooth and waxy, and the bean is not as firm and fleshy as is the Mexican variety.

The *Seychelles and Mauritius vanilla* are often sold as low-grade Bourbon vanilla in our market. They are of small size, pale color and faint odor.

The *South American vanilla* is reddish-brown in color, and has a rank odor, resembling fermented molasses. It is very pulpy, very resinous and exhibits but few crystals on its surface. The pods are often open and the seeds are scattered over their surfaces.

Tahiti vanilla is similar to the former; its market is the Pacific coast and the western states. *Vanillons* (vanilla pompona) of the West Indies are cultivated in and exported from Martinique and Guadaloupe. Wild vanillas of Mexico also contribute vanillons. They are easily recognized by being short, only from four to five inches in length, and are of a twisted appearance, which is due to their being wrapped with twine during the *process of curing*. The odor is different from vanilla, and, as stated by Beringer,[21] may be compared to a cross between a fermented sugar and heliotrope odor. They are used in the tobacco industry and in perfumery, in sachet powders and for making low-grade extracts, but should not be employed for this latter purpose.

"The *Reunion* vanillons may be short, ripe vanilla fruit that has the power of frosting well, mixed with unripe, abortive fruit, whose perfume is simply absorbed from the better beans with which they have been in prolonged contact."[20]

STATISTICS.

Formerly the Oaxaca and Vera Cruz provinces were the principal vanilla-growing districts in Mexico, yielding in 1802 1,793,000 pods.[3] To-day Papantla and Misantla are the center of vanilla culture, and the crop has increased from 700,000 pods in 1866[8] to the enormous amount of 15,000,000 pods in 1893, this figure being the average for the preceding ten years.[23] From Vera Cruz only 100,000 pods were received. The United States imports in 1891[21] were: Mexican, 135.875 pounds; Reunion, Seychelles and Mauritius, 10,000 pounds; South American, 9,000 pounds; Tahiti, 5,000 pounds. In 1896 the total imports into the United States rose from 137,000 pounds of the preceding year to about 237,000 pounds, reperesenting a value of over $1,000,000.[29]

The smallest unripe vanilla weighs 20 pounds to 1,000 pods, the largest ripe vanilla 65 pounds, and the average being 40 to 45 pounds as the weight of 1,000 pods.[23]

The Reunion (Bourbon) plantation ranks second in importance among vanilla-growing districts. The exports have risen from 3 kilograms in 1849 to about 6,000 kilograms in 1860.[27]

The Paris exposition in 1867 seems to have given a stimulus to the consumption of vanilla in France. It advanced afterward in price from 16 to 100 francs a pound. In order to meet the increased demand the government sent out instructions to the colonies to introduce artificial fertilization of the vanilla flowers.[26]

The French importations from her colonies in 1888 were:

From Reunion	pounds	462,660
Guadaloupe	pounds	6,044
Mayotte	pounds	18,195
Ste. Marie	pounds	19,195
Tahiti	pounds	6,410

The Seychelles vanilla crop of 1896 amounted to 63,000 pounds, and was the largest since the establishment of the plantation twenty years ago. The average yield is about 200 pounds an acre.[28]

In searching for data concerning vanilla we corresponded with Dr. V. C. Price, president of the Price Flavoring Extract Company, of Chicago, one of the heaviest consumers of Mexican vanilla in the world, and to him we are indebted for much information. Our illustrations of Mexican vanilla packages are due to his courtesy, as well as is the information that the beans should be at least a year old before they are extracted. He states that they must be watched closely in order to prevent them from molding, and that after they mold, lice quickly appear and the value of the beans is rapidly destroyed. In this connection Dr. Price states that the value of the Mexican vanilla has about doubled within a year, and that no other bean is capable of making high-grade extract.

The quoted prices of vanilla at present are, per pound: Best Mexican, $16; Bourbon, $12; South American, $6; Tahiti, $5; Brazil, $5.[25]

PHYSIOLOGICAL NOTES AND PHARMACOPEIAL RECORD.

A disease to which the name "vanillism' is given has been observed to afflict persons professionally engaged in the handling of vanilla.[17] Humboldt[7] states that the Spaniards abstained from the use of vanilla, as they ascribed to it a harmful influence upon the nervous system. Its use as a medicine has become obsolete in most countries.

The plant was official in the Spanish pharmacopeia of 1817, but is not official in the edition of 1885. The Pharmacopoeia Portugueza of 1876, however, carries it under the name of baunilha, this being derived from *epidendrum vanilla*, Linn. (*vanilla aromatica*, Swartz), and *vanilla planifolia*, Andrews; *myrobroma fragrans*, Salisbury.) The London pharmacopeia adopted vanilla in 1721, but soon afterward discarded it. It does not appear in the recent British pharmacopeias.

Vanilla is official in the recent German, French and *United States* pharmacopeias, being derived from *vanilla planifolia*, Andrews.

LITERATURE ON VANILLA PLANIFOLIA.

(1.) P. Labat, Nouv. Voyage aux Isles de l'Amérique, Vol. VI, p. 96–109. A la Haye, 1724.

(2.) Ph. Miller's Gardener's Dictionary Abridgment, 5th ed., London, 1763. Vanilla.

(3.) A. v. Humboldt, Essai Politique sur le Royaume de la Nouvelle Espagne, 5 vols. Vol. II, p. 338; Vol. III, p. 198 et seq. 1811.

(4.) Hortus Kewensis, Vol. V, p. 219. London, 1813.

(5.) Desvaux, On Vanilla and Its Culture, A. J. Ph., 1847, p. 317. From Ann. Sc. Nat. (3), Vol. V, p. 117.

(6.) Vanilla, A. J. Ph., 1857, p. 315.

(7.) A. v. Humboldt, Reise in die Aequinoctialgegenden des neuen Continents. Stuttgart, 1861–62. Vol. III, p, 235.

(8.) Müller's Reisen. Cultivation of Vanilla in Mexico. A. J. Ph. 1866, p. 38.

(9.) A. Delteuil, Étude sur la Vanille. 1874.

(10.) The Vanilla. From the Gardener's Chronicle, May 23, 1874, A. J. Ph., 1874, p. 417.

(11.) John R. Jackson, Vanilla. A. J. Ph., 1875, p, 317; from Ph. Jour. and Trans., May 8, 1875.

(12.) John M. Maisch, A. J. Ph., 1876, p. 375.

(13.) Vanilla Cultivation in India. A. J. Ph., 1877, p. 38; from Pharm, Jour. and Trans., 1876, Nov. 25.

(14.) Bentley and Trimen, Medicinal Plants. London, 1880, No. 272.

(15,) Jaillet, Culture et Préparation de la Vanille, Rép. d. Pharm , 1880, p. 357 and 411.

(16.) J. Ch. Sawer, Commercial Vanilla, A. J. Ph., 1881, p. 345–349; from Pharm. Jour. and Tr., 1880–81, p. 773–775.

(17.) A. Layet, Étude sur le Vanillisme, Reproduced from Rev. d'Hyg, Sept., 1883. Paris, 1883.

(18.) Flückiger, Pharmacognosie des Pflanzenreichs, 3d ed., Berlin, 1891.

(19.) John M. Maisch, A. J. Ph., 1892, p. 171. Note on Jamaica Vanilla.

(20.) J. Ch. Sawer, Odorographia, Vol. I, p. 143–173. London, 1892.

(21.) George M. Beringer, Some Commercial Vanillas, A. J. Ph., 1892, p. 289–294.

(22.) John M. Maisch, Note on the Epiphytic Character of Vanilla, A. J. Ph., 1892, p. 555.

(23.) Charles E. Hires, A Talk on Vanillas, A. J. Ph., 1893, p. 571–584. See also A. J. Ph,, 1892, p. 554, and A. J. P., 1890, p. 308.

(24.) George M. Beringer, Summary of The Vanillas of Commerce, by R. A. Rolfe, from Kew Bulletin, 1895, August, p. 169; A. J. Ph,, 1895, p. 611.

(25.) American Druggist, 1897, No. 7, p. 214, Vanilla.

(26.) The Production of Vanilla, A. J. Ph., 1874, p, 292.

(27.) Vanilla at Réunion., A. J. Ph., 1862 p. 396.

(28.) Pharm. Journ. and Trans., Nov., 1897, p. 478.

(29.) Oil, Paint and Drug Reporter, March, 8, 1897, Supplement.

(30.) The Chemist and Druggist, Oct. 30, 1897, p. 696.

L792
no. 5
1898

LANE MEDICAL LIBRARY STANFORD
2 45 0062 3594

JATEORHIZA CALUMBA.

BY

JOHN URI LLOYD,

CINCINNATI, O.

REPRINTED FROM
The Western Druggist,
CHICAGO, JANUARY, 1898.

V164
L792
no. 5
1898

LANE MEDICAL LIBRARY STANFORD
2 45 0062 3594

JATEORHIZA CALUMBA.

BY

JOHN URI LLOYD,

CINCINNATI, O.

REPRINTED FROM
The Western Druggist,
CHICAGO, JANUARY, 1898.

JATEORHIZA CALUMBA.*

BY JOHN URI LLOYD.†

BOTANICAL DESCRIPTION AND HISTORY.

Persons familiar with our common yellow parilla, menispermum canadense, have a good idea of the plant that yields the calumba root of commerce. Indeed, a casual observer would take an illustration of one for the other, so closely do they resemble each other in shape of leaf, stem and general floral appearance. One author, Roxburgh (Flora Ind., Vol. 3, p. 807) has placed the plant in the genus menispermum. The genus jateorhiza as now constituted consists of three species, all natives of tropical Africa. It belongs to the natural order menispermaceae. The plant which produces the colombo root of commerce is a herbaceous vine climbing over trees in the forests of eastern tropical Africa in the territory of Mozambique and Quilimani. The leaves are alternate, petiolate, cordate and palmately lobed. As previously stated, they look very much like the leaves of our common yellow parilla. The flowers are dioeceous and borne in pendulous axillary panicles. The female flowers have six sepals, six petals, six abortive stamens and three pistils. The male flowers have the same floral envelopes and six perfect stamens. The anthers, as in yellow parilla, are four-celled, a structure comparatively rare save in this natural order. The plants that produce the root of commerce vary much in the shape of the leaves and in the amount of hispidity in the stem, and were formerly considered as belonging to two species, jateorhiza calumba and jateorhiza palmata, but later botanists have united them under the former name.

---

* Derived from the Greek words *iater*, physician, and *rhiza*, root, evidently in allusion to its healing virtues. Most German and a few English authorities (e. g. Flueckiger (26), the German pharmacopeia of 1890, the U. S. pharmacopeia of 1880, and others) spell the name "jateorrhiza," with the two r's, notwithstanding the fact that Miers, the author of the name (16), spelled it with a single r. In this he is followed by most authorities (except the Germans), including the Index Kewensis, and the U. S. pharmacopeia of 1890. Marmé (Pharmacognosie, 1886), suggests that the name *jatrorhiza*, should be used instead of jateorhiza, and so also does Koehler (Medicinal-pflanzen, 140.)

† The thanks of the writer are extended to Mr. C. G. Lloyd for botanical notes, and to Dr. Sigmond Waldbott, librarian of the Lloyd library, for invaluable assistance.

Calumba (also columbo) root has long been in use under the name "kalumb" among the African tribes of Mozambique, who employed it as a remedy for dysentery and other diseases (Berry)[10]. Undoubtedly the drug was brought by them to the immediate knowledge of the Portuguese when they obtained possession of that country in 1508.[23] Through the influence of their traders, knowledge of the drug was slowly diffused among the Europeans during the sixteenth and seventeenth centuries.

The first definite information regarding calumba root, however, dates from the year 1671, when Francisus Redi (1626-1697), born at Arezzo and physician to the Duke of Toscana, describing it under the name *calumba*[26], made its medicinal virtues conspicuous.[1]

In 1695 the celebrated Leeuwenhoek, in his work "Arcana Naturae," recorded some chemical experiments that he had made with this root, which he calls radix indica, rays columba. He also introduced illustrations of crystals observed in the study of this drug. Contemporaneously with this physicist J. C. Semmendus (probably in 1689 or shortly before) mentions *calumba* in his writings as occurring among drugs originating from India. This author's work has become more prominent in a later edition (1722).[3]

Valmont-Bomare in the 1764 edition of his dictionary describes "calumbe" as the root of an unknown tree brought to us from India. He adds that in Bengal this root is considered a specific in cases of colics,indigestion and against the effects of "mort-du-chien" which is the old French name for colchicum.[4]

Not, however, until in close succession the treatises on calumba root by Gaubius (1771)[5], Cartheuser (1773)[6] and Percival (1773)[7] appeared was there much general distribution of knowledge concerning this drug. In this connection it is perhaps of interest to note that in a previous translation (dated 1755) of Cartheuser's Materia Medica calumba root is not to be found.

Through Percival's recommendation especially the drug rapidly gained entrance into European materia medica, and since about 1776 we find a record of it in many of the pharmacopeias of European countries. However, the geographical and botanical origin of calumba root as yet remained a mystery. The Portuguese, as already stated, having had a monopoly of the trade in this article, seemed to have been careful not to disclose the origin of the drug and made it a custom to carry it to India and then to export it to Europe from Indian instead of African ports. Hence, for a long time the general impression prevailed that the plant was a native of India and that the capital of Ceylon (Colombo) gave the drug its name.

From about 1770, however, the suspicion that calumba root was of African origin had been gaining ground. In this year Philibert Commerson, a French physician, collected a specimen of a certain plant which was growing in the garden of M. Poivre in the Isle de France, which Lamarck in 1797 named menispermum palmatum, stating that this menispermum (of which he described the male plant only) perhaps yielded the root that is brought to us from India under the name of calombo or colombo root. He adds, however, that "it seems to be indigenous to India."[9]

In 1805 a distinct advance was made in establishing its African origin. M. Fortin in this year brought the root of a male calumba plant from Mozambique to the city of Madras, where it was raised and cultivated by Dr. James Anderson. From this specimen Dr. Berry, in 1811, published a botanical description in the "Asiatic Researches"[10] in which he also gives definite information regarding its origin and uses in its native country. The specimen was transported later by him to the Calcutta botanical gardens.[19] De Candolle in 1818 named the plant *cocculus palmatus*. However, the female plant was still unknown.

In 1825 Capt. W. F. Owen brought a male and a female plant from Oibo, in east Africa, to Mauritius, where it was cultivated and observed by Bojer[21]. From this source, at last, Sir W. J. Hooker in 1830 was enabled to describe the whole plant, both male and female, under the name of cocculus palmatus, Hooker.[18]

The name of the genus *jateorhiza* was finally created in 1849 by Miers. (Hooker, Niger Flora, p. 212). *Chasmanthera columba* is another synonym for this plant proposed by Baillon. (Nat. Hist. of Plants, Vol. III., London, 1874.)

DRUG DESCRIPTION AND CONSTITUENTS.

Calumba is collected in the dry season—i. e., in March. The root is perennial and composed of a short rhizome from which issue a number of fasciculated, fusiform, fleshy roots, sometimes of the thickness of an infant's arm and covered with a brown epidermis. These roots are cut into transverse slices and are then slowly dried in the shade.

The U. S. pharmacopeia describes the drug as occurring "in nearly circular discs, 3 to 6 Cm in diameter,* externally greenish-brown and wrinkled, internally yellowish or grayish-yellow, depressed in the center, with a few interrupted circles of projecting wood-bundles, distinctly radiate on the outer portion, fracture short, mealy, odor slight, taste mucilaginous, slightly aromatic, very bitter."

A marked characteristic of this drug is the dark cambium line which separates the bark from the wood. The central depression, which is, of course, due to the greater amount of shrinkage of the less substantial interior, also distinguishes this root from possible adulterations—e. g., bryonia. (See later.)

---

*And 0.5 to 2 Cm in thickness.

The bitterness of calumba is due to three substances —calumbin, berberine and calumbic acid. *Calumbin* is a neutral, crystallizable principle discovered by Wittstock (1830)[26], occurring in the root in amounts determined in different proportions by various investigators, possibly due to varying qualities of the drug or the method of preparation. Some reports are as follows: 0.8 per cent, Wittstock, 1830[26]; 0.4, per cent Duquesnel, 1886[24]; 0.7 per cent, Kremel, 1887[25]. Calumbin is hardly soluble in water, sparingly soluble in alcohol and ether at ordinary temperatures, but more soluble at boiling temperatures. It is also soluble in alkalies, from which solution acids precipitate it unchanged. Various modes of isolating calumbin are described by Wittstock[26], Lebourdais[15], Alessanri[22], Duquesnel[24], Kremel[25] and others.

Berberine was discovered in calumba root by Boedeker in 1840, who also found *calumbic acid*, which he thought to be in combination with berberine.[26]

Starch is a prominent constituent of the drug, constituting about one-third of its weight; hence iodin in solution produces a deep-blue coloration. Tannin, on the other hand, is entirely absent, hence the drug is compatible with iron salts. Incompatibles are quoted to be acetate of lead, mercuric chlorid, lime water, also infusion of galls. Calumba root leaves 6 per cent of ash.

In 1895 Alexander Gunn observed a fluorescent principle in fluid preparations of calumba root and succeeded in separating it[27]. This observation gains strong support by the researches of A. Hilger[28], who in 1896 investigated the chemistry of calumbin, observing that it may be converted by the action of 15-per-cent hydrochloric acid into a yellowish-brown mass, while the solution exhibits a bluish green fluorescence. This he ascribes to the presence of a substance not yet isolated.

The presence of starch no doubt causes the drug to be so freely eaten by worms. Great difficulty is encountered in trade to obtain a batch of the root unaffected by worms. (Gehe, Handelsberichte.)

SUBSTITUTIONS AND RELATED SPECIES.

The marked pharmacological and chemical characteristics of calumba root render the detection of substitution comparatively easy.

Among possible adulterations may be mentioned bryonia alba, the root of which is sometimes cut in slices, dyed yellow with turmeric or safflower and rendered bitter by infusion of calumba or quassia. Bryonia may be recognized by the presence of annular rings, which are present in calumba root only in the center of the largest disks. The most frequent substitute for calumba root is that of the root of frasera carolinensis, also called frasera Walteri. So pronounced and common was this substitution as to lead to the popular common name, *American columbo.* Guibourt asserts that between the years 1820 and 1826 the calumba root entirely disappeared from the French market, and he found that another drug had been substituted without the least objection. That this is likely to be true is evidenced by the fact that immense amounts of American columbo root were gathered in our western states during the first part of this century and disposed of abroad. Guibourt cites the following reactions which distinguish this false drug from true calumba root: Its infusion reddens litmus, forms a greenish-black precipitate with ferrous sulfate, is rendered turbid by isinglass and evolves ammonia by the action of fixed alkalies. Besides, the dark cambium line of the true calumba is absent in the spurious drug, and unlike true calumba it contains no starch. Guibourt first had thought it to be an Algerian plant, but later acknowledged its American origin[20].

In the United States warm advocates of the use of *frasera Walteri* in place of calumba were found in the early part of this century. It was then known as the *Marietta columbo,** (see Coxe, Amer. Disp., 1818, 4th ed.). It also figures among the remedies recommended by Peter Smith (1813), "The Indian Doctor," in his dispensatory (see Amer. Jour. Pharm., Jan. 1898). Being so fortunate as to have in temporary possession perhaps the only copy in existence, the opportunity is taken to quote from this rare work part of what the author has to say (The Indian Doctor's Dispensatory. By Peter Smith, Cincinnati, 1813. Page 13) on the "Columbo or Miami Root":

---

* So named because a well-known physician, Dr. S. P. Hildreth of *Marietta,* Ohio, used it in his practice and described it in Coke's *Dispensatory.*

NO. 4, THE COLUMBO OR MIAMI ROOT

is found in plenty in the Ohio and Kentucky states. This valuable production is several years old before it sends up its stalk. The leaves are very smooth and grow in bunches nearly as big as mullein leaves, but not so wide; the stalk is round like a musket barrel and often grows six or seven feet high, having always four leaves at right angles growing at a joint; its seeds grow in pods shaped like a horse bean, and are much like parsnip seeds.

The columbo leaves occasion sweat copiously when laid to the forehead, and will commonly relieve the headache; and this relief will be found special in many cases—to sweat away boils, inflammations and even old chronic pains. The columbo root ought to be used as a bracing or tonic medicine; but it is both an emetic and a cathartic if taken in large quantities. * * *

One of the peculiar traits of the columbo root is that it braces the stomach, if only two or three chews of it are taken and the spittle or saliva swallowed. * * *

Bitters made of this root are proper to confirm health, and I believe that the root, or its preparations, is the best relief for the nausea and costiveness of a pregnant woman.

The use of this root will, I expect, supercede that of the Jesuit barks and so fill their place that we shall need none of them.

This Miami columbo root is of a pale yellow; its taste is a mild bitter but of a lower jist than the imported, allowed to be so by reason of the odds of climate, yet fully as efficaceous as the other.

This root might be sent to market in great quantities from the Miami country.

Dr. Richard Allison of Cincinnati claims the honor of discovering this to be the columbo root in our country, and to him I am indebted for my first ideas of its virtues. After Dr. Allison had been informed that the doctors in Philadelphia denied it to be the columbo root, I heard him say: "I know the columbo root as well as any of them, and I believe it to be the columbo root."

In 1850 and 1853 Hanbury[17] and Hooker [18] report on a spurious calumba root then being imported from India into England in considerable quantities. The plant yielding it was indeed indigenous to Ceylon, where it grows plentifully and is used as a tonic among the natives; but according to the testimony of Roxburgh,[19] and before him of Thunberg, this plant is not the true calumba root of the materia medica, but is the root of a related species, *menispermum fenestratum*, Gaertner, (*coscinium fenestratum*, Colebrooke). Hanbury gives an excellent illustration of the cross-section of the stem of this plant which was offered in slices as calumba root.

That true calumba root does not grow in Ceylon (see history) is again evidenced in a list of seventy or eighty medicinal plants of Ceylon contained in a dissertation by Dr. Scott of 1819, for calumba root is not enumerated. (Bigelow, Sequel, 1822.)

In 1891 T. H. Wardleworth (Chemist and Druggist, 1891, p. 736), reported a spurious calumba root from western Africa, indiscriminately imported by the new African trading companies. He pronounces the drug to be a stem of a species of tinospora.

Taking the entire record concerning calumba, we may conclude that true calumba was imported from Africa during a period of three hundred years before its origin was known (1508 introduced, 1811 identified by Berry). During all this time the crafty tradesmen led Europeans to believe the drug was of East Indian origin. A spurious calumba root was derived from India and another from America, the latter drug being exported as a substitute in large quantity.

PHYSIOLOGICAL NOTES AND PHARMACOPEIAL RECORD.

Various medicinal virtues have been claimed for this drug. It was at one time said to be efficient in cholera and in cases of nervous vomiting, etc. Conservative physicians agree on its being "a type of a bitter tonic, free from astringency and of stimulating properties." (Gubler, Commentaires, 1874.) More recently calumbin was suspected of being toxic, and possibly for a like reason has been placed under restricted sale in Germany (Hirsch und Schneider, Commentar, 1895.)

The drug is not recorded in any pharmacopeia at our command, prior to 1776. In this year the Pharmacopoeia Edinburgensis, edited by Baldinger, mentions the drug, which is the first record we have seen in English pharmacopeias. In an appendix the author credits the works of Gaubius[5] and Cartheuser[6] as being the source of information. The Pharmacopoeia Londinensis of 1809 (Ed. Powell) states: "Calumbae radix: Root of a plant not yet named." In 1824 it is mentioned as being derived from cocculus palmatus, De Candolle.

As far as we can ascertain, the modern pharmacopeias, including that of the United States, describe it under the names of jateorhiza calumba or jateorhiza palmata, while the French codex derives the drug from chasmanthera palmata, H. Baillon (jateorhiza palmata, Miers). The Pharmacopeia Portugueza of 1876 directs the root to be derived from jateorhiza columba, Miers (cocculus palmatus, De Cand.) and jateorhiza Miersii, Oliv. (cocculus palmatus, Hook., non De Cand.)

LITERATURE ON JATEORHIZA COLUMBA.

(1.) Franciscus Redi, Experimenta circa varias res naturales, Amsterd. 1685, p. 142. (See Murray, No. 8), Ital. ed. 1671. (See Flückiger, No. 26.)

(2.) Anton v. Leeuwenhoek, Arcana naturae, Delphis Batav. 1695 p. 87, new ed. Lugd. Bat. 1722, p. 82. (See Flückiger, No. 26.)

(3.) Johan Curvus Semmedus. Pugillus rerum Indicarum, etc. Cura, Abr. Vateri Vitembergae, 1722, p. 32. There is also an undated edition earlier than 1689 in the Portuguese language. (See Haller, Bibl. bot., vol. II, p. 692.)

(4.) Valmont-Bomare, Dict. raisonn. univ. d'hist. nat. 15 vols., Paris, 1800, vol. 2 p. 525, another ed., 5 vols., Paris, 1764, vol. 1, p. 402.

(5.) Gaubius, Adversaria, Leidae, 1771. (See Flückiger, No. 26.)

(6.) J. F. Cartheuser, De radice columba, Francof. ad. viadr. 1773.

(7.) Thomas Percival, Essays, medical and experimental, London, 1773, vol. II, p. 3. First chapter entitled: On the Columbo Root. (See Murray, No. 8.)

(8.) J. A. Murray, Apparatus Medicaminum, vol. V, p. 78-82, Venetiis, 1795.

(9.) Lamarck, Encyclop. vol. IV, p. 99, Paris. An IV, (1797.)

(10.) Andrew Berry (An account of the male plant which furnishes the medicins generally called columbo or columba root), Asiatic Researches, vol. X, p. 385, 1811.

(11.) Mérat & De Lens, Diction. universel. de Mat. Méd. vol II, p. 326. Paris, 1830, and Supplement, (vol. VII) p. 187, 1846.

(12.) Wm. Roxburgh, Flora Indica. Reprinted from Carey's edition of 1832, (vol. III, p. 807), Calcutta, 1874, p. 730.

(13.) W. J. Hooker, Botan. Mag., No. 2970 and 2971.

(14.) R. E. Griffiths, Am. Journ. Phar,, vol. VII, p. 191, 1835.

(15.) Am. Journ. Phar., vol. XXI, p. 90, 1849.

(16.) Hooker, Niger Flora, p. 212 and 214, 1849.

(17.) D. Hanbury, On an Article Imported as Calumba Wood, Phar Journ., vol. X, p. 321, 1850.

(18.) W. J. Hooker, Coscinium Fenestratum, (false Calumba root), Phar. Journ., vol. XII, p. 185, 1853.

(19.) Peters, Reise nach, Mozambique, Botanik, vol. I, p. 172, 1862.

(20.) Guibourt,-Planchon, Histoire des Drogues, seventh ed. vol. III, p. 735, Paris, 1876.

(21.) Charles Pickering, Chronol. Hist. of Plants, Boston, 1879, p. 1026

(22.) P. E. Alessandri. Phar. Journ. and Trans., 1882, p. 993.

(23.) Ficalho, Plantes uteis da Africa portugueza, p. 87, Lisboa, 1884. (See Flückiger, No. 26.)

(24.) Duquesnel, Jahresb. Phar., 1886, p. 64.

(25.) A. Kremel, Extractum Columbo, Jahresb. d. Phar., 1887, p. 471.

(26.) Flückiger, Pharmacognosie des Pflanzenreichs, 3rd ed., Berlin, 1891.

(27.) A. Gunn, A Fluorescent Constituent of Calumba, Phar. Journ. and Trans., 1895, p. 495.

(28.) A. Hilger, Pharm. Journ. and Trans., 1896, p. 85 and p. 378.

V164
L792
no.6
1898

LANE MEDICAL LIBRARY STANFORD
2 45 0062 3586

COPAIFERA OFFICINALIS.

BY

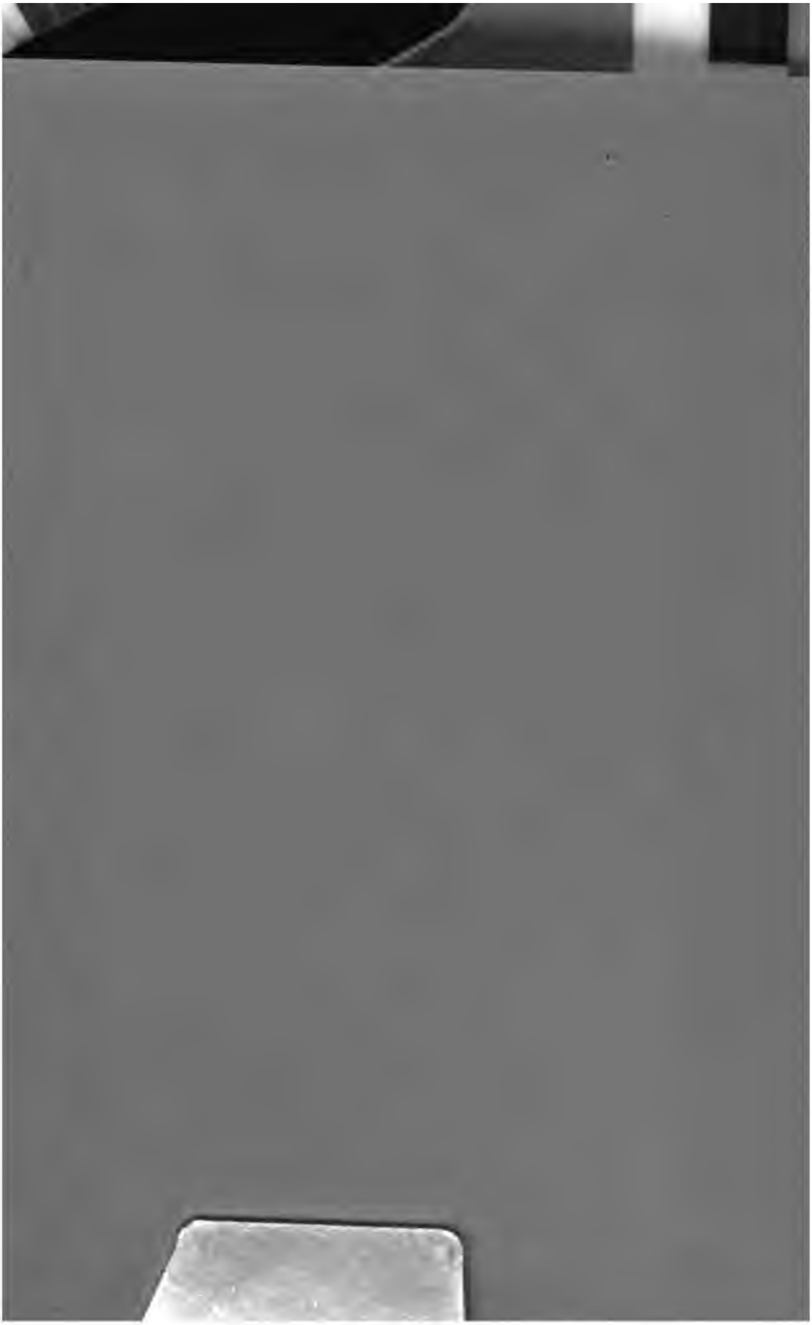
JOHN URI LLOYD,

CINCINNATI, O.

REPRINTED FROM

The Western Druggist,

CHICAGO, February, 1898.



COPAIFERA OFFICINALIS.

BY

JOHN URI LLOYD,

CINCINNATI, O.

REPRINTED FROM

The Western Druggist,

CHICAGO, February, 1898.

COPAIFERA OFFICINALIS.*

BY JOHN URI LLOYD.

BOTANICAL DESCRIPTION AND HISTORICAL NOTES

Copaiba (popularly known as balsam of copaiva) is obtained from South America, principally from Brazil and Venezuela, being produced by numerous species of the genus copaifera. This genus belongs to the suborder of caesalpinieae, of the vast order of leguminosae, and differs from the ordinary type of the order, as we usually know it, in having more regular flowers (papilionaceous), resembling in this respect our honey-locust (gleditschia triacanthos) and coffee-nut (gymnocladus) tree.

The various species of copaifera usually are small trees (sometimes shrubs) which grow in tropical America. The flowers are small, borne in axillary terminal panicles. The calyx consists of four† sepals, or rather a calyx divided almost to the base with four segments. The segments are thick, smooth outside, white (petaloid) and silver-hairy inside, nearly equal, the upper slightly larger. There are no petals. The stamens are eight or ten, with long slender filaments. The pistil consists of a stipitate two-ovuled ovary, densely hairy outside, bearing a slender style. The fruit is a short, thick, one-seeded legume. The leaves of the tree consist of an even number of pinnae, excepting in the species C. Beyrichii (Hayne)[8]; the leaflets are smooth, thick, entire. In general appearance the leaves remind us of those of our rhus venenata, though this shrub has odd-pinnate leaves.

---

*The thanks of the writer are extended to Mr. C. G. Lloyd for botanical notes, and to Dr. Sigmond Waldbott, librarian of the Lloyd library, for invaluable assistance.

† Bentley and Trimen[11] state five, but their plate only shows four; and this number according to Bentham and Hooker is characteristic of the genus.

Flueckiger[12] traced the record of what is probably the first printed statement regarding a resiniferous tree other than the pine, dating back to the last decade of the fifteenth century. He quotes from Michael Herr, "Die Neue Welt der Landschaften und Insulen," Strassburg, 1534, which contains a report made by Petrus Martyr of Anghiera to Pope Leo X, wherein this tree is mentioned under the name *copei*.

The next available record dates from a publication of the year 1625[1] wherein a Portuguese monk, probably Manoel Tristaon, of the convent of Bahia contributes an extensive chapter on Brazil and its products. On page 1308, immediately following the description of *Cabueriba* (or Peru balsam tree) he says: "Cupayba. For wounds. Cuypaba is a fig tree, commonly very high, straite and big; it hath much oile, within; for to get it they cut the tree in the middest, where it hath the vent, and there it hath this oil in so great abundance that some of them doe yield a quarterne of oile and more; it is very clear of the color of oile; it is much set by for wounds, and taketh away all the skarre. It serveth also for lights and burne well; the beasts knowing the vertue thereof doe come and rubbe themselves thereat. There are great store, the wood is good for nothing."

The first explicit description and illustration of one of the trees yielding copaiba is to be found in the joint work of Piso and Marcgrav (1648),[2] whose statements form the basis of the subsequent literature on the subject. In this connection it appears rather remarkable that the Pharmacopoeia Amstelodamensis, sixth edition, which antedates this publication, being of the year 1630, disinctly mentions *Balsam copae yvae.*[12] Some of the statements of Piso and Marcgrav have given rise to discussion; the fact that Piso figured and described the flowers with five sepals, whereas they are now known to bear only four, being one of the points. The pod, however, is figured and described correctly, and the statement is made that it contains an edible nut, which the monkeys of the forest are very found of eating. As regards the mode of collecting the balsam, Piso[2] relates that an incision is made through the bark deep into the pith, at the season of the full moon, which causes such an abundant flow of fatty and oily liquid that twelve pounds may exude in three hours. In case no oil should appear, the opening is at once closed with wax or clay, and after two weeks the yield is sufficient to make up for the delay. The fact that the resiniferous ducts in these trees often attain a diameter of one inch, as has been observed more recently by Karsten[12] seems to be quite in harmony with the statement regarding the abundant yield. It is also related that frequently the balsam accumulates in these ducts and exerts pressure enough upon the enclosing wall to burst the tree with a loud report.[12] According to Piso, the copaiba tree is not very frequent in the province of Pernambuco, but thrives luxuriantly in the island of Maranhon, which he says furnishes the balsam of commerce in great quantity. He also enumerates the many medicinal virtues of the balsam, making the curious statement that its healing virtues are also experienced as an efficient means to check the flow of blood in the Jewish practice of circumcision.

Labat[3] reports that in 1696 he had an opportunity to observe for the first time the tree yielding copaiba in the island of Guadeloupe. He relates in detail the manner of collecting the balsam, which he calls huile de copau. The vessels in which the balsam is collected are made of the fruit of the calabash, a kind of gourd. The collection, he states, takes place about three months after the rainy season; that is, in March for the countries north of the equator and in September for the countries south of this line. The balsam, he states, closes all kinds of wounds except those inflicted by gunshot. He declares it to be a powerful febrifuge, having been used with almost marvelous effect in the fever epidemics at Rennes and Nantes in 1719.

Nic. Jos. Jacquin, a noted Viennese botanist who traveled in the West Indies in Linnaeus' time, first observed the tree yielding copaiba in cultivation in the village of Le Carbet at Martinique, and subsequently (1760 and 1765) described it under the name of copaiva officinalis.[4] He states that this tree was indigenous to the continent, where it grows frequently around the town of Tolu near Carthagena promiscuously among trees yielding balsams of Tolu and Peru. Jacquin described the flowers of this tree as having four petals, and the calyx as being nonexistent; yet he considers it identical with that of Piso and Marcgrav, which is, however, emphatically denied by De Tussac in Dictionnaire des Sciences Naturelles.[6]

Linnaeus, in 1762, gave Jacquin's plant the name copaifera officinalis.[5]

Until 1821 it was generally believed that copaifera officinalis was the only tree yielding copaiba; in this year, however, Desfontaines added two new species, C. guianensis and C. Langsdorffii.[7] At the same time Desfontaines changed the name of C. officinalis to C. Jacquini, in honor of its discoverer. The fact that Jacquin's plant was foreign to Brazil and yielded a balsam of inferior quality would indicate that it could not well have been the official balsam tree, while by reason of the publication of Piso's account Brazil had been generally considered the geographical source of the official balsam. However, the name C. officinalis Linn., has subsequently been upheld, although the official copaiba balsam is now considered as being mainly derived from C. Langsdorffii, the species named by Desfontaines in 1821 in honor of Mr. Langsdorff, the Russian consul general at Rio Janeiro, from whom the specimens were obtained. This name was erroneously *spelled "Lansdorffii"* by Bentley and Trimen,[8] who thus perpetuated what was undoubtedly an error of print in Desfontaines' original memoir.[7] Soon thereafter the recorded species of copaiba increased rapidly. In 1826 Hayne (Arzney-Gewaechse)[8] published and described sixteen different species, which, however, all bear resemblances, their distinctive features residing mainly in the form and the arrangement of the leaves. Hayne especially endeavors to place the species made known by Piso, the difficulty being that this ancient work stated that the wood is colored as if with minium. The only species that, in the opinion of Hayne, would answer that description is C. bijuga, the wood of the branches of which is pale-red, which color may appear as red in the trunk of the tree. Hayne also states that copaiva is gathered from all species known to the natives, and concludes that most of the balsam is yielded by C. multijuga in the province of Para, a species, however, which is now questioned.

According to Flueckiger,[12] the following species are the principal sources of the copaiba of commerce:

1. Copaifera officinalis, L. (Guiana, Venezuela, Colombia, Trinidad).
2. Copaifera guianensis, Desf. (Lower Amazon, lower Rio Negro, Cayenne, Surinam.)
3. C. coriacea, Martius. (Bahia and Piauhy).
4. C. Langsdorffii, Desf. (Continental provinces of Brazil).

The number of known species has steadily increased until now the Index Kewensis recognizes twenty-three American and five African species.

The copaiba obtained from the vast territory of the Brazilian continent, along the Amazon and its tributaries, is collected in the shipping port of Para. Maranham island is also a place of export. Other shipping ports are Maracaibo and Angustura in Venezuela, Trinidad, Demerara (British Guiana), Cartagena (Colombia) and Rio de Janeiro.

The imports of copaiba into this country during a recent period were as follows:

In 1888,	pd. 12,262	In 1891,	pd. 205,480
1889,	pd. 163,624	1892,	pd. 185,280
1890,	pd. 206,240	1893,	pd. 80,000
1894,	pd. 82,000		

CONSTITUENTS AND ADULTERATIONS.

Two varieties of copaiba are distinguished in commerce: the Para variety from Brazil, a thin clear, pale aromatic, somewhat active and bitter fluid; and the Maracaibo variety from the Antilles and the adjacent parts of the continent, a thick, golden-yellow, sometimes faintly fluorescent oil, having an odor suggestive of turpentine.

Balsam of copaiba, so-called, is not a balsam in the strict sense, for the term balsam is properly applied to such resinous exudations as contain the aromatic principles benzoic or cinnamic acid, both of which are absent in copaiba. Copaiba is an oleoresin, consisting of a volatile oil, which holds a nonvolatile resin of acid properties in solution. The proportion of oil varies considerably with the different specimens, ranging from 30 to 60 per cent, sometimes being as high as 80 per cent, or even more. Both the oil and resin have been extensively investigated (see e. g., Flueckiger[12]). Yet the closer chemical study of the oleoresin is beset with many obstacles, owing to the difficulty of procuring authentic specimens, as well as to the great variation in the product itself, due to its being collected from different species or even different trees, and also to the possibility of sophistications not easily to be recognized.

Probably the most frequent adulteration of the balsam is that of turpentine, which is facilitated when the pharmacopeial demand calls for the more viscid variety of the balsam. The U. S. pharmacopeia mentions as the only test for this substance, that when copaiba is *heated it should not* evolve the odor of turpentine. The

German pharmacopeia, third edition, (additions) introduces two ammonia tests for colophony (suggested by Gehe & Co.), the second, the more sensitive, being as follows: "Expel the volatile oil by heating on the water-bath, pulverize the residual resin, and dissolve one part in five parts of ammonia water. The cloudy solution should not gelatinize even after one day's standing." This test is said to detect about 10 per cent of colophony.[17] In this connection, however, see Bosetti, Chemiker Zeitung, 1896, p. 846.

The absence of fixed oils in copaiba is indicated, according to the U. S. pharmocopeia, if upon complete evaporation of the volatile oil, the residue, when cold, becomes amorphous, transparent and friable. One of the direct tests for castor oil is based upon its insolubility in petroleum- benzin, while copaiba, in excess of the solvent, is completely soluble, save a flocculent precipitate. However, it requires the addition of at least ten volumes of petroleum-benzin (Maisch[18]) for the precipitation of part of the admixed castor oil.

Another possible (perhaps probable) admixture is that of gurjun balsam, or wood-oil, obtained from various species of gigantic trees (dipterocarpus) native to India.* This balsam has the property of thickening when heated to 130 deg. C., especially in closed tubes. Mr. L. F. Kebler has employed with much satisfaction the following test suggested by Messrs. Dodge and Olcott, for the presence of gurjun balsam in copaiba: "Place 1 Cc of glacial acetic acid (99.5 per cent) in a test-tube; to this add 4 drops of pure concentrated nitric acid (s. g. 1.42), mix well; then add to this mixture, carefully, 4 drops of the balsam in question; if gurjun balsam is present, within five minutes a reddish zone will appear between the layer of balsam and the acid. On mixing the con-

---

*According to Mr. Kebler, about 30,000 pounds of gurjun balsam were imported in 1894 without any authentic information being *obtainable* concerning its disposition.

tents of the test-tube well, the whole will assume a reddish or purple color."[15] Another test, by which it is claimed that 1 per cent of gurjun balsam may be detected is given by Ed. Hirschsohn,[16] and consists in heating a mixture of 1 volume of the balsam, 3 volumes of 95-per-cent alcohol, and 1 gram of stannous chlorid. If gurjun balsam is present, a pink coloration appears, becoming violet-red after one-half hour, but after one hour's standing its vividness disappears.

In testing copaiba the German pharmacopeia, 1890, introduces directions for the determination of the acid number and the ester number, calculated to detect an admixture of colophony and compound ethers (or esters).

Copaiba has the property of solidifying when triturated with 6 per cent of its weight of calcined magnesia (mass of copaiba, U. S. P.). According to Roussin, the condition necessary to bring about solidification is the presence of water, either in the balsam or in the base. When both bodies are anhydrous the balsam remains liquid.[11] In this connection it may be said that the process of the U. S. pharmacopeia (and of other pharmacopeias as well) for making solidified copaiba directs the magnesia to be previously triturated with a little water.

PHARMACOPEIAL RECORD.

As before stated, an early Amsterdam pharmacopeia mentions "balsam copae yvae" as early as the year 1630. Although we find the drug on record in Pharmocopoeia Amstelædamensis Renovata, 1726, we are unable to find it mentioned in the earlier Pharmacopoeia Ultrajectina of 1664.

Flueckiger[12] states that to his knowledge the earliest record of the drug in English pharmacy dates back to the year 1677. Yet the London pharmacopeia of 1689 does not contain it.

The modern pharmacopeias refer the origin of the drug, *which they respectively* call copaiba (U. S. P.), also copaiva (Br. P.), copahu (Fr. Cod.) to several species of copaifera, especially from copaifera Langsdorffii (Desf.(sometimes and, as previously stated, wrongly spelled Lansdorffii. (See Proc. Am. Phar. Asso., 1879, p. 250.)

SUMMARY.

In closing our study on this very interesting substance (balsam of copaiba), we need scarcely remark that the work has been as unsatisfactory as it is enticing. Possibly no other drug is more unfortunate. Its uncertain origin, owing to the number of species that yield it, as well as the sophistication at home and abroad, render attempts at scientific exactness in tests a problem for the future. Unquestionably the pharmacopeia is wisely conservative in its method concerning the drug that has no precise origin and that admits of such possibilities in the line of admixtures.

LITERATURE ON COPAIFERA OFFICINALIS.

(1) Samuel Purchas, His Pilgrimes, 5 vols., London, 1625, vol, II, p. 1308.

(2) Guil. Pisonis, De Medicina Brasiliensi, p 118; et Georgii Marcgravii Histor. Rer. Nat. Brasil., p. 131 Lugd., Bat. et Amst., 1648, 2d ed. Gul. Pisonis, De Indiae utriusque re natural. et. medica, etc., p. 118, Amstelaed., 1658.

(3) Labat, Nouveau Voyage aux Isles de l'Amerique, vol. II, p. 313-319. 1724.

(4) N. J Jacquin, Enumer, Syst. Plant. Carib. Lugd. Bat., 1760 Also see Select Stirp. Americ. Historia. p. 133, Vindob., 1763.

(5) Linnaeus, Spec. Plant., Vol. 1, p. 557, 2d ed., 1762.

(6) De Tussac, in Dictionn. des Sciences naturelles, 71 vols., Paris, 1816-1830, vol. X, p. 309-313; 1818.

(7) Desfontaines, Mem. Mus., Paris, vol. VII, p. 376, 1821.

(8) F. G. Hayne, Darstellung & Beschr, d. Arzneygewaechse, Neue Subscr., 4th vol., Heft X., Nos. 12-23, Leipzig, 1854.

(9) Guibourt-Planchon, Histoire des Drogues Simples, Vol. III., p. 467, 1876.

(10) John M. Maisch, Note on the Detection of Castor Oil in Copaiba, Am. Journ. Pharm., 1877, p, 131.

(11) Bentley and Trimen, Med. Plants, Vol. II., No. 93, London, 1880.

(12) Flueckiger Pharmacognosie d. Pflanzenreichs, 3d ed., p. 92-99, 1891. Also see Am. Journ. Pharm., 1876, p. 362.

(13) John C. Umney, African Copaiba, Ph. Journ. and Trans., Dec. 1891, p. 450, and Sept., 1893, p. 215. Also see Am. Journ. Pharm.; 1892, p. 33, and 1893, p. 544.

(14) P. L. Simmonds, Notes on Some Saps and Secretions Used in Pharmacy. Amer. Journ. Pharm, 1895, p. 128.

(15) L. F. Kebler, Balsam Copaiba versus Gurjun Balsam, Am Journ. Pharm., 1895, p. 394; also see Balsam Copaiba, etc., Am. Journ Pharm., 1897, p. 577.

(16) Ed. Hirschsohn, Pharm. Zeitsch. f. Russland, 1895; see Jahresber. d. Pharm., 1895, p. 49,

(17) B. Hirsch & A. Schneider, Commentar z. Arzneibuch, Goettingen, 1895, p. 195, and 2d part, p. 15.

[From The Western Druggist, November, 1898.]

ON THE SPELLING OF THE NAME COPAIFERA LANGSDORFFII.

BY CHARLES RICE, NEW YORK.

I cannot refer to Desfontaines' original (Mem. Mus. Paris, VII. (1821), 377), but to judge from the Kew Index and some other authorities, Desfontaines spelled the species name Lansdorfii. And from Desfontaines the mistake passed into many succeeding books. Even Bentley and Trimen took up the mistake, particularly emphasizing that Langsdorfii is wrong. The mistake was pointed out long ago in the Pharmaceutical Journal, IX (1879). 773, and also by Flueckiger in Pharmacographia (see 2d ed., p. 228, foot-note).

Some of the botanical authors who happened to know better corrected the mistake without making any remarks. Thus, for instance, Baillon has it right in all his works, for instance in Histoire des Plantes, II, 163; also, Rosenthal in his Synopsis Plantarum Diaphoricarum, p. 1046, etc. They write Langsdorffii (with g and two f's).

George Heinrich, Freiherr von Langsdorff, was

Hesse, studied medicine at Goettingen, then went to Portugal, where he remained from 1797 to 1803. He then participated in Krusenstern's Russian exploring expedition, after which he became Russian chargé d'affaires in Brazil. In 1831 he returned to Germany and died at Freiburg in the Breisgau on June 29, 1852. He wrote an account of Krusenstern's expedition, under the title: ""Bemerkungen auf einer Reise um die Welt," 2 vols. Frankfurt o. M., 1812.

* * *

NOTE BY PROF. J. U. LLOYD.

To the Editor of the Western Druggist:—The accompanying interesting letter concerning the spelling of the name Langsdorff, from Dr. Charles Rice, should become a matter of public record. I have, therefore, by permission of Dr. Rice, assumed the responsibility of asking you to give it a place. You will perceive that it concerns the paper on Copaiba (Vol. XX., p. 54).

John Uri Lloyd.

[In justice to Mr. Llyod it should be added that a study of the name was made by him, but his letter, embodying the same result as shown by Mr. Rice, arrived at this office too late for use in the journal.—Ed. W. D.

[From THE WESTERN DRUGGIST, November, 1898.]

ON THE SPELLING OF THE NAME COPAIFERA LANGSDORFFII.

BY CHARLES RICE, NEW YORK.

I cannot refer to Desfontaines' original (Mem. Mus. Paris, VII. (1821), 377), but to judge from the Kew Index and some other authorities, Desfontaines spelled the species name Lansdorfii. And from Desfontaines the mistake passed into many succeeding books. Even Bentley and Trimen took up the mistake, particularly emphasizing that Langsdorfii is wrong. The mistake was pointed out long ago in the Pharmaceutical Journal, IX (1879). 773, and also by Flueckiger in Pharmacographia (see 2d ed., p. 228, foot-note).

Some of the botanical authors who happened to know better corrected the mistake without making any remarks. Thus, for instance, Baillon has it right in all his works, for instance in Histoire des Plantes. II, 163; also, Rosenthal in his Synopsis Plantarum Diaphoricarum, p. 1046, etc. They write Langsdorffii (with g and two f's).

George Heinrich, Freiherr von Langsdorff, was

W64
L792
no.7
1898

LANE MEDICAL LIBRARY STANFORD
2 45 0062 3578

CROTON TIGLIUM.

BY

JOHN URI LLOYD,

CINCINNATI, O.

REPRINTED FROM

The Western Druggist,

CHICAGO, APRIL, 1898.

CROTON TIGLIUM.*

BY JOHN URI LLOYD.

BOTANICAL DESCRIPTION AND HISTORICAL NOTES.

The genus croton, established by Linnaeus in 1737, is extensive, 625 species being recognized in the Index Kewensis. We have a number of herbaceous species in this country, but none of any economic importance. The croton plant is a native of India and is grown all through the East Indies. It is a small tree fifteen to twenty feet high. The leaves are ovate, petiolate, acuminate, alternate, the margins faintly serrate. The flowers are borne in loose terminal spike-like racemes, and are monoicious, the male flowers being at the top of the the raceme, the females below. The male flowers have five sepals, each sepal bearing a yellow gland, five petals, and from ten to twenty stamens with slender filaments. The female flowers have floral envelopes similar to those of the male, and a large sessile, three-celled ovary, thickly covered with stellate hairs and bearing three slender styles, each style dividing into two linear stigmas. The fruit is a three-celled capsule, each cell having a single seed which yields the croton oil of commerce.

Croton tiglium is considered indigenous to Malabar, Ceylon, Amboina (of the Molucca islands), the Philippines and Java. Joannes Scott, in his dissertation on the medicinal plants of Ceylon (Edinburg, 1819), states that the seeds of croton tiglium under the name of "gayapala," are a most powerful purgative, and also that the leaves are very acrid, causing an intolerable burning in the mouth and throat.

Dr. Irvine, in 1848, gave a short account of the materia medica of Patna" (part of the province of Bengal) mentioning "jamalgoota," which he stated is derived from croton tiglium and several other species of croton. The croton seeds furnish a violent purge and are made into pills with ginger and "kutkaranja or kath karanja seeds," which he explains are known as bonduc nut (the febrifuge seed of caesalpinia bonducella, or nicker tree).

---

*The thanks of the writer are extended to Mr. C. G. Lloyd for botanical notes, and to Dr. Sigmond Waldbott, librarian of the Lloyd Library, for valuable assistance.

More recently, Mr. O. Weynton[11] calls attention to the occurrence of croton tiglium in all parts of the fertile and wealthy province of Assam, especially in the dry districts. He states that the demand for the drug is small and that the plant has a tendency to spread. Hence efforts are being made to restrict the growth and keep it within certain bounds.

The ancient Hindu physicians were not acquainted with the drug, which seems to have originated in China, from whence at an early day the seeds were also introduced into Persia (where they are now called *dand*), by way of the caravan routes of central Asia. Subsequently the Arabs derived their knowledge of the seeds from the Persians, their name, hab-el-kathai (Cathay seeds), being in turn suggestive of the Chinese origin.[12] Some of the vernacular Indian names, according to Dymock, seem to indicate that the plant reached India through the Himalayan province of Nepal.[13]

The drug was imported into Europe by the Dutch during the 16th century. The first account of the croton tiglium plant in European literature, however, must be credited to the Portuguese physician Christoval Acosta, who in 1578 described the wood as lignum pavanæ (or L. panavæ or L. moluccense), and the seeds as pini nuclei moluccani.[1] The prominent writings of Rheede (1678), who gives the Malayan name cadel avanacu,[15] Ray (1688) and others subsequently, gave the drug due consideration, while C. Bauhinus (1671) differentiated between several synonyms of the seeds and woods that were then in use. To Caspar Commelyn (1667-1731) is attributed the first use of the name cataputiæ minores for the seeds, while the well-known synonym grana tiglii is also stated to have been originated in his time. And yet this author's work on the Flora Malabarica (1696) does not record the first term, although the name grana tiglii is therein accredited to Samuel Dale's Pharmacologia, (the first edition of which appeared in 1693).[8]

As regards the use of the oil derived from the seeds, E. von Hirschheydt, in the exhaustive historical introduction to his dissertation,[12] mentions that Peter Borellus, a French physician (1620-1689), in 1657 lauds the cathartic virtues of the oil which in as small an amount as two drops caused purging even when merely rubbed into the skin. Similar mention of its virtues is made by Rumphius (Herbarium Amboinense, 1750). Geoffroy[9] in his Materia Medica (1756) reports that the natives of India use this oil to make what they call the royal purging apple (poma cathartica), the mere odor of which is said to purge persons of delicate constitution. The directions for making this potent "apple" are as follows:

Macerate an orange or a lemon in oil of tilli (croton oil) for one month. Remove it, hold to the nostrils and inhale the breath; soon afterwards the bowels will move.

About 1750, Cohausen, according to several authorties, employed the oil with success in cases of tenia.

Although during the 17th and 18th centuries the remedy had been frequently used, it seems that towards the end of the 18th century it fell into oblivion, probably on account of the dangers attending its administration. However, its use was revived when in 1812, several Engish physicians, among them Drs. White and Marshall, observed the action of the seed in medical practice in India, and brought the drug again to the notice of the profession in Europe.[13] Ainslie in 1813, and Conwell in 1819, by their publications gave it further prominence. In connection with its reintroduction we note the interesting fact that a Mr. Short then brought the drug to Europe and was so fortunate as to secure the right (license) to its exclusive sale in England. That it at once became an important drug is shown by the attention then given it in medical literature. An extensive list of references to the literature on croton tiglium covering the period from 1820 to 1835 alone, may be found in Hirschheydt's dissertation.[12] According to the latter authority (1890) the seeds and the oil are seldom used in Europe other than in veterinary practice, as he states, on account of the uncontrollable influence exerted by the presence of the powerfully toxic ricin (an albuminoid body) in the oil.

As already stated, the genus croton was established by Linnaeus in 1737,[4] the name being adopted from the Greek synonym for ricinus communis, the seeds of which, as also those of croton tiglium, have a resemblance to a tick (dog-tick, *kroton* in Greek). As to the origin of the term tiglium, some authorities ascribe it to the Moluccan island of Tilho, while others[6] believe it to be derived (by Dale?) from the Greek word *tilos*, meaning diarrhea. The botanical and vernacular synonyms antedating the name given by Linnaeus are numerous and are generally carried by the older botanico-medical works, e. g. by Dale,[3] Bauhinus,[2] and others. The post-Linnaean synonyms recorded in the Index Kewensis are rarely if ever seen in pharmaceutical print and may well be reproduced. They are as follows:

(1) C. acutus, Thunberg, 1784.
(2) C. jamalgota, Hamilton,[15] 1825.
(3) C. pavana, Hamilton,[15] 1825.
(4) Kurkas tiglium, Rafinesque, (Sylva Tellur.) 1838.
(5) Halecus verus (?) Raf. 1838.
(6) Tiglium officinale, Klotzsch, 1843.
(7) Croton muricatus, Blanco, 1845.
(8) Anisophyllum acutifolium, Bouv. 1860–61.

CHEMICAL CONSTITUENTS AND PROPERTIES:

While it has long been known that all parts of the croton tiglium plant (root, bark, leaves and seeds) produce the drastic effects of the oil, only the seeds * and the oil resulting therefrom have merited extensive investigation.

The oil is usually abstracted by pressure but is also obtained by extraction with carbon disulfid. Two varieties are distinguished in trade, the India and the English oil; and at present the larger amount is expressed in England

---

*Synonyms: Croton seeds; grana tigliae, tiglii, or tilli; graines de Moluques; petits pignons d'Inde (in contradistinction to pignons d'Inde, the seeds of jatropha curcas) semina tiglii; purgiernuesse, etc.

(it is said by only one firm) from seeds imported from India. The kernels contain from 50 to 60 per cent of oil, the testa were observed by Zinnel (Amer. Jour. Pharm. 1890, p. 122) to contain about 1.65 per cent.

The chemical investigations of croton oil have been directed towards the isolation of both the vesicant and the purgative principles.

Nimmo of Glasgow, in 1823, was probably the first to observe that alcohol dissolves the vesicant part, leaving behind a comparatively inert oil. Buchheim and Krich in 1857[12] obtained an alcohol-soluble vesicant and an alcohol-insoluble purgative. From the latter, by saponification, these investigators isolated a principle that was both vesicating and purgative, closely related to ricinoleic acid (its lead salt being soluble in ether) to which they gave the name crotonoleic acid. This early work of Buchheim is given detailed consideration by E. von Hirschheydt.[12] Schlippe,[7] in 1858, again observed that the alcohol-soluble part of the oil was by far the most active vesicant. His analysis revealed the presence of glycerids of stearic, palmitic, lauric, myristic and oleic acids, and what he believed to be angelic acid, as well as *crotonol*, the strongly-vesicating, resinous principle, ($C_9H_{14}O_2$) which he considered to be a polyvalent alcohol, and for the isolation of which he gave explicit directions. Crotonol when boiled with alkalies or even with water or dilute sulfuric acid is easily decomposed, a resinous, inert substance resulting.

Geuther and Froehlich[8] in 1870 demonstrated the melting point of Schlippe's angelic acid to be 64° C., thus showing that it could not be true angelic acid, which melts at 45° C. They named it tiglinic acid, a substance afterward found by Schmitt and Berendes[9] (1878) to be Frankland and Duppa's methyl-crotonic acid, $C^6H_8O_2$, or CH_3 CH : C (CH_3) COOH). Schlippe's crotonic acid was declared by Geuther and Froehlich to be a mixture of acetic, butyric and valeric acids; Schmidt and Berendes found isobutyric (not butyric) and a valeric (isobutyl-formic) acid.

Harold Senier[20] in two series of investigations, 1878 and 1883, observed that croton oil became more soluble as it aged, and with seeming disregard of former investigations concerning this point, concluded that croton oil may be conveniently differentiated by alcohol into a vesicating, alcohol-soluble part and a purgative alcohol-insoluble part; the conclusion being that the oil improved with age as far as the vesicating principle was concerned. The correctness of this separation theory, however, inasmuch as it implied the existence of a fundamental difference between the alcohol-soluble and the alcohol-insoluble part, was invalidated by the exact experiments of Kobert and v. Hirschheydt as well as by Buchheim's and Krich's observation of the fact that a vesicant principle may be isolated from the purgative portion. However, to Senier belongs the credit of having ascertained, in his second series of investigations, that the vesicating principle is to be found in that part of the alcohol-soluble oil represented by a nonvolatile fatty acid the barium salt of which is soluble in alcohol. Buchheim having resumed in 1873 the study of this subject failed to isolate the true vesicant principle on account of having sought it in less soluble barium salts.

Kobert and v. Hirschheydt[19] in 1890 finally decided that the efficacy of the alcohol-soluble part of croton oil as a vesicant is due to the presence of free *crotonoleic acid*, which also composes as a glycerid the alcohol-insoluble part of croton oil. L. Reuter has recently (1890) shown that free crotonoleic acid increases the solubility of the neutral glycerid in alcohol. This acid is liable to decomposition, and may be destroyed on saponification of the glycerid with even weak bases. Kobert prepared this vesicant compound by treating the alcohol-soluble part of an oil containing as much as possible of the *free* acid, with baryta water; removing the barium salts of the inert acids by treatment with water; abstracting the barium oleate and crotonoleate with ether and finally separating the crotonoleate from the evaporated solution by means of cold absolute alcohol. The free crotonoleic acid is then obtained as an oily mass by adding the calculated amount of sulfuric acid, extracting with ether and evaporating the solvent.

Kobert and v. Hirschheydt also demonstrated that the neutral oil (insoluble in alcohol) may be decomposed by the pancreatic ferment, the acrid crotonoleic acid being thereby liberated.

Finally, Prof. W. R. Dunstan and Miss L. E. Boole[14] investigated crotonoleic acid. After fractionally differentiating it into some inert oily acids, the last fraction contained a powerfully vesicating resin which the authors called *croton resin*, a hard, light-yellow, brittle substance, chemically of no pronounced character, nearly insoluble in water, readily soluble in alcohol, ether and chloroform. Prolonged boiling with caustic alkalies destroys its vesicating power; splitting it thereby into acids of the acetic acid series. Whether this croton-resin exists as such in the oil, or whether it is a modification product of crotonoleic acid, we may still consider to be an open question.

PHARMACOPEIAL RECORD.

Croton oil is now official in all modern pharmacopeias, yet we are unable to find it in any pharmacopeia of the last or previous centuries. It was introduced into the London pharmacopeia, in 1824, as Oleum Tiglii, while in the U. S. pharmacopeia it has been official since 1830.

LITERATURE ON CROTON TIGLIUM.

(1) Christobal Acosta, Tractados de las Drogas y Medicinas de las Indias Orientales; Burgos, 1578. Also see Caroli Clusii Exoticorum libri decem, Antwerpiae, 1605, p. 277.

(2) Casp. Bauhinus, Pinax Theatrici Botanici; Basileae, 1671, pp. 393 and 492.

(3) Samuel Dale. Pharmacologia; 1st ed., London, 1693; a later ed., London, 1751, p. 77.

(4) Linnaeus, Genera Plantarum, 1st ed., 1737, p. 288, and Species Plantarum, 3d ed., 1764, p. 1,425.

(5) Geoffroy, Matière Médicale, 10 vols.; Paris, 1756, Vol. 3, p. 293.

(6) G. C. Wittstein, Etymolog. Botan. Handwörterbuch, 2d ed., Erlangen, 1856.

(7) Thomas Schlippe, Lieb. Annal., Vol. 105, p. 1 (1858). Also see Am. Jour. Pharm., 1858, p. 409.

(8) Geuther and Frœhlich, Zschr. f. Chem., Vol. 6, 1870, pp. 26 and 549.

(9) Schmitt and Berendes, Lieb. Annal., Vol. 191, 1878, p 94. Also see Pharm. Jour. and Trans., June 7, 1879, p. 1,000.

(10) Harold Senier, Pharm. Jour. and Trans., March 9, 1878, p. 705, and Dec. 8, 1883, p. 446.

(11) O. Weynton, The Commercial Products of Assam, Pharm. Jour. and Trans., 1887, Vol. XVIII, p. 162.

(12) Ernst von Hirschheydt, Ueber die Crotonolsæure, R. Buchheims with additions by R. Kobert. Contained in Arbeiten des Pharmacolog. Instit. zu Dorpat, Vol. IV, Stuttgart, 1890, pp. 5–80.

(13) Dymock, Warden and Hooper, Pharmacographia Indica, Part V, 1892, p. 281.

(14) W. R. Dunstan and Miss L. E. Boole, Croton Oil, etc.; Proc. Roy. Soc., June 20, 1895; abstract in Pharm. Jour. and Trans., July 6, 1895, p. 5.

(15) Francis Hamilton, a commentary on the second part of the Hortus Malabaricus, Trans. Lin. Soc., Vol. XIV, 1825, pp. 258 and 259.

V164
L792
no.8
1898

LANE MEDICAL LIBRARY STANFORD
2 45 0062 3560

CITRULLUS COLOCYNTHIS

BY
JOHN URI LLOYD,
CINCINNATI, O.

REPRINTED FROM
The Western Druggist,
CHICAGO, JUNE, 1898.

v164
L792
no.8
1898

LANE MEDICAL LIBRARY STANFORD
2 45 0062 3560

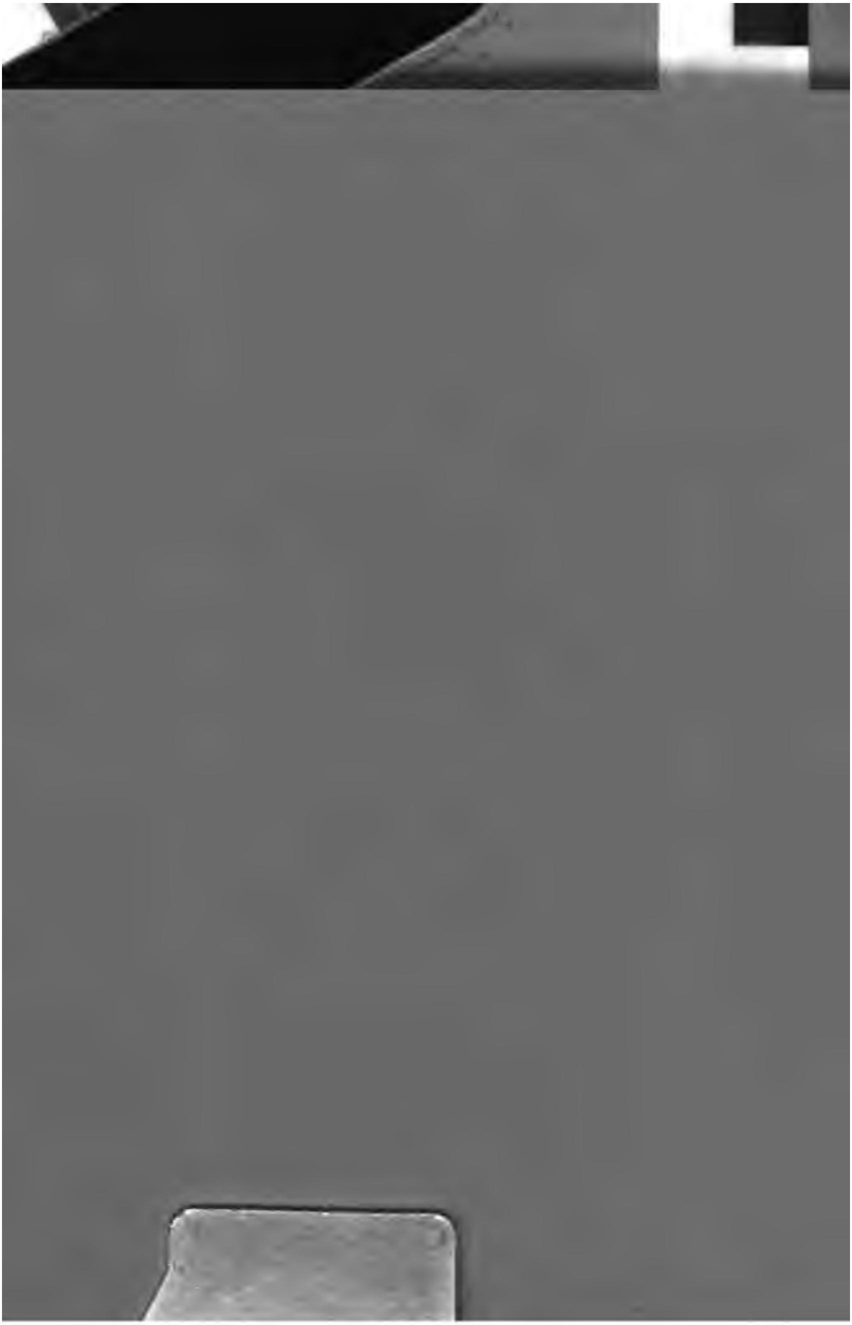
CITRULLUS COLOCYNTHIS

BY

JOHN URI LLOYD,

CINCINNATI, O.

REPRINTED FROM
The Western Druggist,
CHICAGO, JUNE, 1898.



CITRULLUS COLOCYNTHIS.*

BY JOHN URI LLOYD.

BOTANICAL DESCRIPTION, HABITAT AND CULTIVATION.

Persons familiar with the common watermelon vine need no description of the plant which produces colocynth apples. Indeed, if you will imagine a watermelon vine bearing a small, hard fruit with a bitter pulp, you will have a very close idea of the colocynth plant. Naudin, a French botanist, succeeded in crossing the colocynth vine and the watermelon, producing fertile seed, thus demonstrating that they are essentially the same species. Remarkable is the botanical relationship that exists between not only this plant and the watermelon but other garden melons belonging to the allied genus cucumis, as the pumpkin, the muskmelon, and the cucumber. In the latter plant we also find a similar cathartic principle. The difference between these two genera, citrullus and cucumis, are very slight. The former has solitary sterile flowers and branched tendrils, the latter clustered sterile flowers and simple tendrils.

The colocynth plant is a native of arid soils. It has a large, fleshy perennial root, which sends out slender, tough, angular, scabrid vine–like stems. These usually lie on the ground for want of something to climb over, but which, if opportunity present, climb over shrubs and herbs by means of axiliary branching tendrils.

The leaves are angular, lobed and, as already stated, almost the exact duplicate of watermelon leaves.

The flowers are yellow, long-peduncled, solitary in the axils of the leaves. They are monecious, the stamens and pistils being borne in different flowers on the same plant. Each has a yellow campanulate, five-lobed corolla and a five-parted calyx. The female flowers are readily distinguished by a globose, hairy, inferior ovary.

---

*The thanks of the writer are extended to Mr. C. G. Lloyd for botanical notes, and to Dr. Sigmond Waldbott, librarian of the Lloyd Library, for valuable assistance.

The fruit is globular, smooth, with a hard but thin rind, something like a gourd. It is filled with a soft, white pulp, in which are imbedded numerous seed. This pulp is the article used in medicine.

The colocynth plant occupies the vast area extending from the west coast of northern Africa (Senegambia, Morocco and the Cape Verde islands), eastward through the Sahara, Egypt, Arabia, Persia, Beluchistan and through India, as far as the Coromandel coast and Ceylon, touching northward the Mediterranean and Caspian seas. At the Red sea, near Kosseir, it occurs in immense quantities.[14] It is also found here and there in southern European countries, e. g., Spain and the islands of the Grecian archipelago. Isolated specimens occur in the cape of Good Hope, Japan, Sicily,[9] and it is suggested[7] that birds of passage have much to do with the distribution of the seed. Even from our hemisphere we have recent reports of its successful cultivation on a small scale.

In the island of Cyprus the raising of colocynth has been a source of revenue since the fourteenth century, and still forms an article of export at the present time.

Colocynth, as already stated, is distinctly a desert plant, giving evidence of the dominion of life even in such arid regions (Grisebach[7]). Hooker and Ball[8] met with it in the oasis of Sheshuaua in Morocco, and state that this characteristic plant of the desert region in north Africa rarely approaches the littoral zone. The fruit is used in Morocco for the purpose of protecting woolen clothing from moths; but according to the testimony of these observers the purgative qualities of colocynth do not seem to be known to the native doctors.

Volkens[12] enumerates citrullus colocynthis (L.) Schrader, among the plants growing in the Egypto-Arabian deserts, pointing to its exceedingly rapid development, especially the fruit, which attains a diameter of 10 centimeters. After the vine has withered away the fruits may be seen lying in the sand of the desert, ten to fifteen in number, about each plant. Volkens saw the plant in bloom in May as well as in December, and reports that when the plant is torn from the ground it withers in a short time, owing, he thinks, to the delicacy of the microscopical structure of the leaves.

A brief account of the growth of colocynth in Palestine has more recently appeared in the United States consular reports (1895) from which we abstract the following points of interest:[19] The fruit grows abundantly between the mountains of Palestine and the eastern shore of the Mediterranean, from the city of Gaza northward to Mount Carmel. The plant thrives without any attention whatever on the part of the husbandman, since the climate and soil are all-sufficient for its perfect growth—the natural requirements being merely a sandy soil, warm climate and little moisture. The fruit which is known in commerce as the Turkish colocynth is collected by the native peasants (fellaheens) in July and August, before it is quite ripe, and is sold to Jaffa dealers, who peel it and dry the pulp in the sun. It is then molded into irregular small balls, packed in boxes and exported, mostly via England. The average annual shipments is stated in the consular reports to be 10,000 pounds, but it must have fallen off considerably during recent years. (See statistics below.) The reason for this, as we learn from another source,[16] lies undoubtedly in the export tax. The report suggests that probably colocynth may be profitably cultivated in certain parts of the United States.

In this connection we may point to Prof. L. E. Sayre's paper[18] on American colocynth (1894), and the cultivation of colocynth in Montreal as reported in 1895 by Prof. T. D. Reed.[21]

The drug is imported from Spain, Triest, Smyrna, Mogador, and elsewhere.[5]

Some distinguish between the Egyptian (the largest fruit, being 10 centimeters in diameter), the Cyprus, and Syrian colocynth[10] (the latter varieties having a diameter of 5 to 6 centimeters),[10] others between the Turkish (peeled) and the Mogador (unpeeled) varieties.[9] In 1885 Mr. Umney called attention to a commercial specimen named "Persian colocynth," that much resembled the Turkish variety. It had evidently been compressed in the fresh state, probably in order to lessen the freight rate when reckoned by volume instead of by weight.[11]

STATISTICS.

In 1839 the imports of colocynth into England amounted to 10,417 pounds.[5]

The export from Jaffa, in Syria, and its monetary value in recent years were as follows:[16]

1892,	88,700 pounds.	£.2,580=$12,900.
1893,	42,000 pounds.	£ .950=$ 4,750.
1894,	10,000 pounds.[19]	
1895,	6,000 pounds.	

The export from Cyprus[15] in the middle ages (under Venetian rule) was 2,500 okes a year=6,750 pounds. In 1889 it was 4,616 okes a year=12,650 pounds. £.461=$2,305. In 1890 it was 7,108 okes a year=19,480 pounds. £.739=$3,695.

HISTORY, CONSTITUENTS AND USES.

Colocynth is an exceedingly ancient medicine. It is believed to be the wild gourd (pakkuoth) of the Old Testament, regarding which Hieronymus Bock (1556) facetiously remarks[2] that colocynth serves only the physician but not the cook, unless he has learned the art from the Prophet Heliseo, who prepared for the children a sweet dish from the fruit. The Biblical paragraph to which Hieronymus refers is to be found in the Second Book of Kings, chapter IV, 38.

38. And Elisha came to Gilgal, and there was a dearth in the land; and the sons of the prophets were sitting before him: and he said unto his servant, set on the great pot and seethe pottage for the sons of the prophets.

39. And one went out in the fields to gather herbs, and found a wild vine, and gathered thereof wild gourds his lap full, and came and shred them into the pot of pottage; for they knew them not.

40. So they poured out for the men to eat; and it came to pass, as they were eating of the pottage that they cried out, "O thou man of God, there is death in the pot," and they could not eat thereof.

Its exceedingly bitter tastes and its violent purgative properties were well known to the ancient Greek and Roman physicians.

Dioscorides,[1] who uses the name "kolokynthis,"* gives the synonyms cucumis amara, cucurbita silvatica, cucurbita alexandrina, and cucurbita caprina; also the foreign terms, thymbre, autogenes, and tutastra. The Arabs called it "alhandal," and by Mesue it was called "fel terrae," or earth-gall, in reference to its exceeding bitterness; a very appropriate, almost poetic term.

The dangerous character of the drug was pointed out by the medieval physicians who observed that bloody ulcerations are liable to occur in the intestines where some of the pulp would imbed itself in its lining membrane. H. Bock (Tragus) speaks of two varieties of colocynth,[2] one of the foreign origin and powerfully active, the other cultivated in Germany, much milder in action. From the foreign colocynth, he states, the ancient electuary, called "hieras picras," was originally made, and advises people to beware of traveling quacks who administer the foreign colocynth, boiled in wine, as a purgative, adding, that with such art nearly all the Jews are acquainted.

---

*Many derive this word from *Kolon*, Greek for bowels, and *Kineo*, move, hence, a cathartic; while Hehn(6) perceives rather a connection with *Kolossus*, owing to the size of some of its relations. The name kolokyntha, used by Dioscorides in another chapter refers to an edible species of cucumis.

Colocynth entered into the composition of numerous preparations of more or less ancient date, such as confectio hamech, trochisci alhandal, Stahl's pills, Morison's pills, Barclay's anti-bilious pills, etc., and is still a valued medicine.

The colocynth, or bitter-apple, of commerce (also called *pomoquinta* by O. Berg), when deprived of its rind, as is mostly the case, presents a white, light and spongy pulp that readily breaks into three wedge-shaped pieces, each holding imbedded near its outer rounded surface a number of flat, ovate seeds. The proportion between pulp and seed varies according to different authors, from 23 to 33 per cent of pulp and 67 to 77 per cent of seed. The intensely bitter taste of colocynth resides in the pulp only, while the seeds at best contain only traces of it; hence the advisability of removing the inert seeds before making pharmaceutical preparations of colocynth. The bitter taste and the powerful medicinal virtues of the pulp are due to the presence of a probably amorphous glucosid *colocynthin*, first identified and named by Meissner and by Vauquelin (1818), and later investigated and obtained more pure by Walz, Henke and others.[14] It is soluble in water and alcohol, but insoluble in benzol, benzin, carbon disulfid and ether. Dilute acids resolve it into dextrose and tasteless *colocynthein*, acetic acid being likewise formed (Speidel, Dissertation[15]). Walz obtained from an alcoholic extract of colocynth an ether-soluble crystalline and tasteless substance insoluble in water, which he called *colocynthitin*. The ash of the pulp varies from 8.6 to 14 per cent (Squire[17]) while that of the seeds amounts to about 2.5 per cent.[14]

At one time it was believed that the seeds exert a slight physiological action, being a mild and safe purgative.[4] Bergius,[3] however, as early as 1778, explicitly states that the pulp is the sole carrier of the bitterness, and that the traces found in the seed may be removed *by washing in tepid water*. When the absence of bitterness is indicated by the taste, the seeds no longer purge. He adds that the seeds should be removed in order to avoid the contamination of the extract of colocynth with the fatty oil of the seed.

Proof of the innocuousness of the seeds is established by the fact that they afford an important food material to African tribes of the desert.

In this connection we quote from Flueckiger's report[6] of an interesting account given of the mode of preparation of colocynth seeds as observed by the celebrated German Sahara traveler, Doctor Nachtigal, who visited the poor tribe of the Tibboo Resade in 1870. This is one of the tribes inhabiting the mountainous country of Tibesti in the central part of Sahara. They settle the upper valleys of the rivers where the land is somewhat fertile. Their sole food resources are the milk of goats and a few miserable products from vegetable life, chief among which, strangely enough, are the seeds of colocynth, called "aber," which they collect on special nomadic expeditions. The scantiness of their resources compels these people to be very economical in searching out and preparing this strange food. After the bulk of the pulp is removed the seeds are enclosed in strong sacks and tramped upon in order to facilitate the removal of the last traces of the bitter pulp. The seeds remain whole and are cleaned by winnowing. They are then mixed with ashes from camel's dung, placed upon a smooth stone and rubbed with a rounded stone, which has the effect of crushing the testa. The kernels are then sifted and are thus obtained rather pure. Other Tibboo tribes (Duveyrier) attain the same end by roasting the seeds. Doctor Nachtigal further relates that the seeds are then boiled in water for a short time, the fresh leaves of the ethel bush (?) being added. The last trace of bitterness is afterwards removed by cold water. The seeds are then dried in the sun, powdered, and mixed with dried and powdered dates, and the food thus laboriously obtained, is said to be exceedingly palatable and nutritive.

Flueckiger, commenting upon the latter feature of the process, points out that the kernels form about one-third of the whole seed, which he found to contain 16.94 per cent of fatty oil, 5.93 per cent of albumen, 2.48—2.7 per cent ash, and 7.17 per cent of water; hence the painstaking process adopted by these African tribes results in a product containing 48 per cent of fatty oil and 18 per cent of albuminous matter, properly diluted by the addition of the sweet powder of dates. Too high a tribute cannot be bestowed upon these half-civilized people whose necessities and instincts led to the preparation of such an exceedingly rational nourishing food by extricating it from its poisonous enclosure.

PHARMACOPEIAL RECORD.

The Pharmacopoea Augustana of 1581 gives directions for the preparation of *trochisci alhandal* and *electuarium majus hamech*, both of which, devised by Mesue, the Arab medical writer, contain colocynth as their basis. The term trochisci alhandal was applied as a synonym for *colocynthis praeparata* as late as 1861 by the pharmacopeia of Hanover.

An official price list appended to the Pharmacopoea Augustana of 1684 quotes one-half ounce of colocynth pulp with seeds at 5 kreuzer, pulp alone at 12 kreuzer, and the seeds are quoted at 1 kreuzer, which tends to show that some medicinal importance was at that time attached to the seeds.

In this connection it is worthy of notice that the German pharmacopeia of 1890 explicitly directs the use of colocynth pulp containing the seeds, but in 1872 the pulp only was to be used, and again, in 1882, no special directions were given.

Hirsch and Schneider, commenting at length on the advisability of including the seeds in the making of pharmaceutical preparations,[20] state that this practice is at variance with the direction of all other pharmacopeias, excepting the French codex and the latest Pharmacopoea Fennica.

Colocynth occupied a place in the Pharmacopoeia of the Massachusetts Medical Society, Boston, 1808, and has been official in every issue of the Pharmacopoeia of the United States.

LITERATURE ON CITRULLUS COLOCYNTHIS.

(1) Dioscorides, lib. IV, cap. 175; ed. by C. G. Kühn, Lipsiae, 1829, Vol. 1, p. 669.
(2) Hieronymus Bock (Tragus), Kreuter Buch, Strassburg, 1556, p. 313.
(3 P. J. Bergius, Materia Medica, Stockholmiae, 1778, Vol. II, p. 782.
(4 Murray, Apparatus Medicaminum, Venetiis, 1795, Vol, I, p. 217.
(5) Pereira's Elements of Materia Medica, etc.; ed. by Jos. Carson, Philadelphia, 1846, Vol. II, p. 510.
(6) Flückiger, Die Koloquinthe als Naehrpflanze. Archiv. d. Pharm, 1872, Vol. 201, pp. 235-247.
(7) A. Grisebach, Die Vegetation der Erde, Leipzig, 1872, Vol. II, p. 97.
(8) J. D. Hooker and John Ball, Journal of a Tour in Morocco and the Great Atlas, London, 1878, p. 113.
(9) Bentley and Trimen, Medicinal Plants, No. 114, London, 1880.
(10) Karsten, Deutsche Flora, Berlin, 1880-83, p. 889.
(11) C. Umney, Pharm. Jour. Trans., 1885, Vol. XVI, p. 107.
(12) Georg Volkens, Die Flora der Aegyptisch-Arabischen Wüste, Berlin, 1887, p. 122.
(13) Rud. Speidel, Beitrag zur Kenntniss des Bitterstoffs von Citrullus Colocynthis. Dissertation (Erlangen). No date.
(14) Flückiger, Pharmacognosie des Pflanzenreichs. 3d ed., 1891, p. 886.
(15) The Chemist and Druggist, 1892, Vol. 41, p. 612.
(16) The Chemist and Druggist, 1894, Vol. 44, p. 699.
(17) Squire's Companion to the British Pharmacopeia, London, 1894, p. 204.
(18) L. E. Sayre, American Colocynth, Amer. Jour. Pharm., 1894, p. 273.
(19) Edwin S. Wallace, U. S. Consular Reports, 1895, Vol. 47, p, 545.
(20) B. Hirsch and A. Schneider, Commentar zum Arzneibuch für das Deutsche Reich, 3d ed., Göttingen, 1895, pp. 269 and 324.
(21) T. D. Reed, Montreal Pharm. Journal, 1896, p. 334.

V164
L792
no.9
1898

LANE MEDICAL LIBRARY STANFORD
2 45 0062 3552

ALOE SUCCOTRINA.

BY
JOHN URI LLOYD,
CINCINNATI, O.

REPRINTED FROM
The Western Druggist,
CHICAGO, August, 1898.

CONCLUSION OF LLOYD'S DRUG STUDIES.

The monograph on aloes by J. U. Lloyd appearing in the present number no doubt will be read with unusual interest, as it is one of the most important and valuable in the entire series. Its publication was deferred at the request of the author who found the subject extremely tangled and perplexing, especially in its early history, and he desired time to clear as far as possible all doubtful points, and we are sure that the picture now presented is as true and faithful as it is possible to present.

The present monograph brings to a successful close a brilliant series of fifteen studies of standard drugs, and our readers will regret this fact no less than the editor and the publishers.

The Western Druggist conceived the plan, selected the subjects, and submitted tracings of the illustrations taken from Koehler's Medicinal pflanzen to the author of the papers with the request that if possible he undertake the work personally, to which request he acquiesced, the aim being to present comprehensive useful scientific studies of the drugs under consideration. Great care was exercised as far as possible to exclude all but first-hand authorities. Many valuable scientific data have been brought before our readers; also many new and interesting historical features in connection with these important standard drugs, and facts concerning their early records that have slumbered in ancient books of travel, rare botanical works or in histories inaccessible to most pharmacists. And in no other place, perhaps, could this work have been done than in the great Lloyd Library, and we know of no other man who could have performed it so well as Mr. John Uri

Lloyd, to whom in this place we desire to express our thanks for the faithful manner in which he has acquitted himself of his arduous task.

That our effort in bringing these contributions before the profession is appreciated is evidenced by the fact that permission to translate and republish them in Germany has been asked and granted, and also from the fact that the author has been greatly encouraged by many communications from well-known authorities who appreciate the research as well as the scientific and historical value of the contributions. We do not know of a similar amount of work having been put on any line of similar magazine contributions in America, and it is no vain assumption to predict that future writers of works on materia medica will find it necessary to refer to this work of Mr. Lloyd when compiling the historical portions of the respective drugs.

[Editorial in the WESTERN DRUGGIST for August, 1898.]

ALOE SUCCOTRINA.

BY
JOHN URI LLOYD
CINCINNATI, O.

REPRINTED FROM
The Western Druggist,
CHICAGO, August, 1898.

ALOE SUCCOTRINA.

BY JOHN URI LLOYD.*

BOTANICAL DESCRIPTION AND HISTORY.

The genus aloe comprises a large family of succulent-leaved plants native of tropical countries. Most of the species have showy flowers and many are cultivated in hot-houses. Aloe succotrina "grows in the Indies, and especially in the island of Soccotera" (Lam.)[10], but has long been cultivated in England. It is a shrub five or six feet high, with a stem marked with the scars of the fallen leaves. The stem is at first simple, but when the plant is old the stem is usually divided. At the top of each branch is borne a large cluster of thick, crowded, fleshy leaves. Each leaf is one and one-half to two feet long, rounded beneath, flattened on the upper side, the margins being each a row of white spines. The flowers are in a large terminal spike-like raceme, proceeding from the center of the leaf cluster. The flowers are orange-red, nodding, cylindrical, each borne on a short peduncle slightly exserted. The pistil has a three-celled, many-seeded ovary and a long simple style.

---

*The accompanying essay on aloes closes the series of fifteen papers on medicinal plants contributed to the Western Druggist, The work has been to me both instructive and enticing, although, appreciating the amount omitted from each paper, by reason of necessary discriminative excisions, I cannot but feel dissatisfied. Very interesting side issues connected with the history and introduction of each drug was, necessarily, also passed in silence. Hundreds of literary treasures outside those recorded in the subject matter were unearthed in the bibliographical study and these likewise, much to my regret, could not be utilized. By restricting the book references with the utmost severity the list was brought within reasonable limits; had this not been done, they would have dominated each issue of the journal. That injustice has been shown many valuable works by omitting their titles from among the references, I do not deny, and in extenuation can only say that credit may be given not only the works cited, but all others in the Lloyd Library connected with the subjects studied.

In closing I take pleasure in extending my thanks to Mr. C. G. Lloyd, who wrote the botanical notes; to Dr. Sigmond Waldbott, librarian of the Lloyd Library, for invaluable assistance; and to Mr. A. W. Whelpley, librarian of the Public Library of Cincinnati, for many courtesies. And, lastly, I desire to thank Mr. Engelhard and Mr. Vogeler of the Western Druggist for their patience and care concerning proof and revisions of same, and it is also due them that I should *take on myself all blame* for the blemishes that may stand.—J. U. L.

The earliest history of the aloe plant is somewhat obscured by the fact that the name aloe, for example as it occurs in the Bible, relates to a substance entirely different from the inspissated juice of the various species of the modern aloe plant. The aloe of the Bible is the wood of *aquilaria agallocha* (Roxburgh) or *lignaloes*, which was used among the ancient nations as an incense and was held in high esteem on account of its scarcity.[8] With modern cathartic aloes it has nothing in common except the bitterness.

The aloe plant is considered by modern writers to have grown wild in India from a very remote period.[26] It was most likely introduced into that country by the Arabs who probably were the first distributers of knowledge concerning the medicinal virtues of aloes. This drug was employed by Galen, and later described by the Greek and Roman writers of the first century, chief among whom are Dioscorides and Pliny, whose descriptions of aloes and its uses, however, bear much resemblance to each other.

Socotrine aloes appears to have acquired its reputation at an early date. Clusius[9] in 1593 reports that Mesue, the Arabian pharmaceutical writer, "the father of pharmacopeias," (who died about A. D. 1028) knew of the Socotrine origin of aloes, mentioning Persia, Armenia and Arabia likewise as sources of aloes of commerce. Ibn Baitar (1197-1248) speaks of aloes from the island of Socotrine as being superior to that of the Arabian district of Yemen.[24]

The name aloe socotrina was undoubtedly derived from the island of Socotra off the entrance to the Red sea. Yet, some authors maintain[5] that this appellation was by some given to the inspissated juice of aloe (*succus citrinus*) on account of the lemon-yellow color of its powder in the axis of a pinkish bract. The stamens are six,